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The Marquis of Stafford.

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24-11-05
1661

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Thomas Hollis, Esq.r F.R.& A.S.

of Corscombe in the County of Dorset.

Drawn by J. Mavins, Engraved by Charles Warren.

from an original Bust in the possession of Dr. Disney.

16766

TRANSACTIONS

OF THE

SOCIETY,

INSTITUTED AT LONDON,

FOR THE

ENCOURAGEMENT

OF

ARTS, MANUFACTURES, and COMMERCE;

WITH THE

PREMIUMS offered in the Year 1805.

VOL. XXIII.

LONDON:

Printed by C. SPILSBURY, Angel-Court, Snowhill.

Sold by the HOUSEKEEPER, at the SOCIETY'S HOUSE, in the ADELPHI; and by Messrs. ROBSON, J. WHITE, BECKET, JOHNSON, CADELL and DAVIES, PHILLIPS, WALTER, RICHARDSON, LONGMAN and REES, and TAYLOR.

[Price TEN SHILLINGS and SIXPENCE.]

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PREFACE.

TO the memory of the late Thomas Hollis, Esq. of Corscombe, in the county of Dorset, the Society have paid a tribute of respect by prefixing his Portrait as a frontispiece to the present Volume of their Transactions.

This gentleman was born in London, April 14, 1720, and was elected a member of the Society soon after its institution. He zealously promoted its interests, on many occasions, by his personal attendance at their meetings, and in March 1765 subscribed liberally towards the present building of the Society.

Mr. Hollis died suddenly at Corscombe on the 1st of January, 1774. By his will he left £100 to the Society, and bequeathed the principal part of his property to the late Thomas Brand Hollis, Esq. who took the name of Hollis on succeeding to that fortune.

The following account of Mr. Thomas Hollis, which appeared in one of the public papers

announcing his death, is expressive of his character and pursuits in life:

" He was a man formed on the severe and " exalted plan of ancient Greece; in whom " was united the humane and disinterested " virtue of Brutus, with the active and deter- " mined spirit of Sydney: illustrious in his " manner of using an ample fortune, not by " spending it in the parade of life, which he " despised, but by assisting the deserving, and " *encouraging the Arts and Sciences*, which " he promoted with zeal and affection; know- " ing the love of them leads to moral and in- " tellectual beauty."

The Engraving of Mr. Hollis's Portrait, executed by Mr. Warren, does honour to that eminent artist's taste and execution.

The Society have, as usual, carefully revised their List of Premiums, and have offered additional Rewards, viz. In Chemistry, article 79, *for rendering Muslin less combustible*, in consequence of the many terrible accidents which have occurred from ladies' dresses taking fire suddenly. The modes at present known to prevent the combustion of muslin are by immersion of it in alum water, or in solutions

of

of some other earthy or metallic salts; something, however, more effectual, is yet desired.

Where dresses actually take fire, if the persons have presence of mind to roll themselves on the floor, in a woollen blanket or carpet, the danger will probably sooner be obviated than by any other means yet known, equally near at hand. Even if the carpet, according to the present improvident custom, should be nailed down, the very act of rolling on the floor will facilitate the purpose of extinguishing the flames.

In the Polite Arts premiums are offered *for Paintings in Oil*, article 103; and various modifications, deserving attention, are made in most of the other articles entered under this Class.

The excellent paper furnished by Dr. Roxburgh, in the Twenty-second Volume of the Society's Transactions, on Vegetable Fibres, the growth of India, has induced the Society to offer a premium, Class 178, for a proper *Substitute for Hemp;* an article at present so essential to our Navy.

The Society, upon the plan commenced in their last Volume, have proceeded to comprise, in a much less compass, a greater variety of useful

useful matter than their preceding Volumes contained; and the Plates, which elucidate the subjects, do credit to the Society and to the ingenious artist, Mr. Porter.

The Class of *Agriculture* commences with an account of very extensive plantations of Larch and Scotch Fir Trees, made by the Earl of Breadalbane; with some observations on his mode of procuring stronger roots and hardier plants, which he thinks deserving of attention.

Thomas Johnes, Esq. of Hafod, still continues to improve that beautiful situation, by increasing his plantations; and has set an example worthy of attention and imitation, by lately raising 922,000 Oaks, together with other valuable timber-trees.

The Culture of Beans and Wheat, in the manner detailed by John Christian Curwen, Esq. of Workington Hall, is particularly deserving of notice. Upon the plan mentioned by him, the land is brought into excellent order in a short time, a protracted fallow is avoided, and the crops of Beans and Wheat rendered very productive. His method of cutting the Beans at an earlier period than usual, appears

to

to have the double advantage of procuring them of a better colour, without injuring their quality, and of rendering the straw admirable fodder.

His experiments in feeding Milch Cows during the Winter present very useful information, and may eventually be the means of preserving the lives of several thousand infants; many children being annually lost in this metropolis, and other large cities and towns, for want of this necessary diet.

The improvement of Waste Land, by Mr. William Taylor, of Beamish, contains a clear and accurate detail of the mode by which he has completed a very extensive undertaking in this line, and the considerable advantages resulting to him from it, will probably promote the views of this Society, by encouraging other persons to commence similar pursuits, so important to the kingdom.

Captain John Miller, R. N. nephew to Mr. Shipley, the worthy founder of this Society, has invented an ingenious pair of Shears, to prevent sheep from being wounded in shearing; a circumstance which has frequently occurred from the ignorance or carelessness of the

the persons commonly employed in that business.

The account furnished by Samuel Taylor, Esq. of Moston, shows, probably, the best method yet devised of procuring excellent Hawthorn Fences, at a moderate expense. Inspection of the Specimens preserved in the Society's Repository will afford convincing proof of its efficacy.

The Culture of Carrots, as Food for Cattle, is fully detailed in Mr. W. Wallis Mason's communication. His experiments are accurate, and the medical receipts he has given, promise to be of considerable use in the veterinary art.

Such persons as are interested in the Growth of Plantations will find, in Mr. John Farey's paper upon this subject, many minute and interesting observations; and how the value of such plantations may, from time to time, be practically and accurately ascertained.

The truly scientific manner in which Mr. William Smith has explained his method of Irrigation, promises to introduce a system by which grass land can be more improved than by any mode with which we are acquainted; and we recommend an actual examination of the

the soil thus meliorated, as the best means of ascertaining the fact.

Mr. William Watson, of North Middleton, in a valuable communication on the comparative Culture of Turnips by broad-cast and drill husbandry, shows the advantages arising from the latter, particularly when sown with broad intervals and managed as he recommends.

A paper on the Plantation of Osiers, by Mr. Seth Bull, of Ely, confirms the benefits arising to the planter and the public from the growth of this useful article.

Under the Class of *Chemistry*, the method of making cheap Paints, by the use of Fish-Oil as a vehicle, will be found of great use for wood and palings much exposed to the weather. The price is considerably less than the paints in common use; it may be prepared by servants who have not been used to such business; it has the advantage of greater durability, and will not blister or peel off by exposure to the sun and air.

Mrs. Jane Richardson's method of cleansing Feathers from their Animal Oil, and removing the offensive smell of new feathers used in fur-

niture, is cheap, effectual, and may be advantageously employed in every private family.

The process furnished by Mrs. Anne Morris for cleansing Silk, Woollen, and Cotton Goods, by the liquor of grated potatoes, has the advantage of being cheap, simple, and efficacious, without damage to the colour of the article upon which it is applied.

The Premiums which have been bestowed this year in the Class of *Polite Arts*, will be found under the title of Rewards, with some account of the subjects rewarded; amongst the Drawings were some of great merit, particularly one by Miss Mary Hay, which not only obtained the first Premium in the Class to which it belonged, but an additional compliment of Twenty Guineas from the Society, for the great excellence of her performance.

Under the Class of *Manufactures*, the very laudable exertions of Mr. William Corston to find employment for poor children, to derive benefit from sterile land, and to improve the public revenues, by a substitute for the Leghorn Straw Plait, deserve commendation, and merit the protection and encouragement of the public as a national object.

In

In the Cotton and Woollen Manufactures of this kingdom, the consumption of crooked Wires for making the Cards used in preparing the Wool for spinning, is immense. Mr. Joseph Beard, of Coggeshal, has been this Session rewarded by the Society for a very ingenious Machine, by which what formerly occupied many hands in preparing imperfectly, may now be better performed, with ease and expedition, by one person. The complete Machine, which cuts and doubles two wires at the same time, may be easily worked by a child, and may be seen in the Society's House.

Mr. John Austin, of Glasgow, has produced to the Society several curious Inventions, by which the figured work in the Muslin trade is much expedited. He has also furnished some Porcelain Stamps, to answer the purpose of those cut in wood or metal.

To the Class of *Mechanicks* the Society have as usual been particularly attentive.

The exertions of Mr. George Smart to supersede the necessity of Climbing Boys for cleansing chimneys are minutely recorded; and, though his Machines will not answer in every case, yet when we consider in how few it fails,

and that it will in many instances answer, where boys cannot be employed, and that in others it will extinguish fires in chimneys more effectually than by any known means, it will be found well deserving of adoption and encouragement.

Mr. Gilbert Gilpin's improved Crane, and his method of using chains to work over pullies with less friction than ropes, and with greater durability, convey much information in this department of Mechanicks.

The diseases to which Shoemakers are liable from their work being commonly performed in a sitting posture, induced the Society to reward Mr. Holden, as noted in the last Volume, for a Machine to obviate the inconvenience. Another Machine, still better adapted for the purpose, invented by Mr. Thomas Parker, forms an interesting paper in the present.

The Quadrant and Staff, invented by Mr. Robert Salmon, will be found a useful instrument in navigation and land-surveying.

Mr. Peter Herbert's invention of a Book-Case Bolt is calculated to save trouble and afford security, as one turn of the key secures the

the lock and two bolts of the folding doors, or opens them at pleasure.

The many serious accidents which happen to horses in drawing carriages upon rail-roads engaged the attention of Mr. Charles Le Caan, and led him to contrive a Stop or Check for the wheels of carriages, calculated to prevent this evil.

Great advantages arise from the quick communication of intelligence, especially in a state depending upon commerce, and opportunities are thereby afforded frequently to prevent ships from being wrecked. The Day and Night Telegraph, invented by Mr. Joseph Davis, seems to possess these means in a degree superior to any of the machines at present in use for the purpose.

In the construction of machinery in general, particularly where cog wheels are employed, considerable difficulties occur in adjusting the proper speed or velocity between the moving power and the motion of the machine, so as to give the greatest possible advantage to both. The expanding Rigger, or Band Wheel, invented by Mr. Andrew Flint, affords means for adjusting the relative velocity of the machinery

and moving power at pleasure, so as to permit the machine to be worked to the greatest advantage.

Since the inland commerce of this island has been so much increased by canal navigation, it has become important to prevent the communication from being interrupted. Want of water in the higher levels has been severely experienced during the summer season, and has rendered economy in the use of it indispensable in the locks through which boats have occasion to pass. Mr. Robert Salmon's contrivance obviates in a great degree this inconvenience, and displays no small share of judgment and mechanical abilities.

The machine invented by Mr. J. J. Hawkins for cutting Paper and the edges of Books, will be found greatly to facilitate the business of the stationer and bookbinder, and to accomplish its purpose with neatness and facility.

The unpleasant circumstances attending the frequent breaking of the springs of door-latches and box locks, owing to the carelessness of servants, have called forth the attention of Mr. J. Antis, who has rendered the springs much

more

more simple and durable, without requiring them to be frequently cleaned or oiled.

Improvements in clock and watch-making have not only greatly extended our foreign exports in this valuable branch, but have led the way to many inventions in the cotton and woollen machinery which have greatly enriched this country. The Clock invented by Mr. Henry Ward, of Blandford, displays a considerable ingenuity in its mechanism, and is free from the disagreeable noise which accompanies the striking of other clocks.

Mr. J. Antis, who has been before mentioned, has invented a detached Escapement of a Pendulum Clock, and a curious Remontoir. To this gentleman, whose mechanical pursuits are with him a mere amusement, much praise is due for employing his time so meritoriously.

Mr. J. Watkins has produced to the Society an improvement in Time-Keepers, reducing the friction of the movements, and has explained its effects with much ingenuity.

Mr. William Hardy appears to have removed a great difficulty attending Time-Keepers made for discovering the longitude, occa-

sioned by the differing expansions or contractions of the metals of which the balance is composed. The Compensation Balance, of his invention, deserves particular attention for the simplicity of its construction, its easy management, and certainty of effect.

Mr. John Prior, of Nessfield, in Yorkshire, has been made known to the public from several inventions, for which he has at different times been rewarded by the Society. The invention now noticed of his Larum, which will fit to any pocket-watch, occupies very little space, may be placed on a chair by the bed-side, or moved about at pleasure, possesses the advantage of waking the person at any hour desired, or giving an alarm in the house when any danger is apprehended.

The Society have not been inattentive to the interests of the Class which they have denominated *Colonies and Trade*. New sources of information relative to the products of our East-India possessions are annually opening to our view; and the paper upon these subjects, from our valuable corresponding member Dr. Roxburgh, is deserving of much attention.

The Culture of Hemp in Canada is still

attended

attended to by the Society, as will be seen by Mr. William Hughes's communication upon the subject; and we are happy to announce that Government are uniting their efforts to give facilities to this very important object.

An interesting communication will be found from our corresponding member Mr. Vondenvelden, relative to a vegetable produced in Canada called the *Cotton Plant;* and observations are made relative to its sugar and down, and their use. Specimens of this down, or silky substance, also of another article of a similar nature from the East Indies, both probably applicable to the making of cloth, hats, or other such purposes, may be had, for experiments, on the application of any Member at the Society's House.

Improvements in the British Herring Fisheries continue to occupy the attention of the Society, and a future Volume will give farther information of the progress made in them.

The Rewards which the Society conferred in the last Session, will be found particularly detailed under that head, in page 425.

The Society express their thanks for the presents they have received from public bodies

and

and individuals; all which are fully noticed in page 435 of this Volume. They beg leave to hint the great service which would arise to a country like this, dependent upon Arts, Manufactures, and Commerce, from the completion of a valuable Library upon these subjects, and to suggest that the united efforts of individuals in this line, to increase the present Collection of the Society, would greatly promote such an object, and become a national benefit.

We regret that we have to announce the death of that great historical painter James Barry, Esq., whose portrait was affixed to the last Volume of the Society's Transactions.

On the death of Lord Nelson, the Society proposed to commemorate that hero by introducing his portrait in one of the pictures which decorate their Great Room, and Mr. Barry had undertaken to execute it; but the sudden decease of this eminent artist has prevented that intention from being carried into effect.

Mr. Barry died on the 26th of February, in the 65th year of his age; and it was unanimously ordered, by a vote of the Society, "That permission should be given to the per-
"sons conducting the funeral of the late Mr.
"Barry,

" Barry, to place his body in the Great Room
" of the Society the night previous to his inter-
" ment, as the last tribute in the power of the
" Society to offer to the remains of the illus-
" trious artist, to whose labours it is indebted
" for the series of classical paintings which
" adorn its walls."

In consequence of this order, the corpse was placed, in the evening of the 7th of March, in the Great Room, with appropriate solemnity, and the following morning conveyed to St. Paul's Cathedral, attended by several of the Vice-Presidents, and many other Members of the Society, and there deposited between the remains of Sir Christopher Wren and Sir Joshua Reynolds. Mr. Barry's paintings, in the Great Room of the Society, will remain a monument to perpetuate his memory, honourable to himself, and valuable to the Society.

The Society desire it to be clearly understood, that, as a body, they are not responsible for any opinion or representation of facts contained in the following pages. They have allowed the communications to pass in the language

guage and manner of the several persons mentioned, without attempting embellishments of style to the prejudice of the subject matter.

The Rewards bestowed during the last Session equal six times the amount of those given in some former years, and, we trust, will be found to have been conferred with judgment, great pains having been taken fairly to investigate the merits of every claimant *.

It is with pleasure we add, that the number of the Members continues to increase, and the Society to flourish; that the influence of the Society extends to every civilised part of the globe, and the intelligence communicated is disinterested and authentic.

Any useful information addressed to the Secretary, Dr. Charles Taylor, will be laid before the Society, and such inventions or discoveries as on mature consideration may be thought to promise benefit to the public, will meet with an appropriate reward.

It should generally be understood, that to

* The present Session commenced in October last, and will continue till the first Wednesday in June. The next distribution of the Rewards of the Society will take place on Tuesday the 27th of May, 1806.

promote

promote the Arts, Manufactures, and Commerce of the British Empire, is the aim of this Institution; that for a series of more than fifty years, by the Subscriptions of its Members, without any pecuniary assistance from Government, the engagements of the Society have been honourably discharged, and that their bounties are not merely confined to the Premiums they offer, but extended to every object which their title professes to encourage.

Adelphi, London,
March 24, 1806.

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PREMIUMS offered by the SOCIETY, *instituted at* London, *for the Encouragement of Arts, Manufactures, and Commerce, for the Year* 1805.

TO THE PUBLIC.

THE chief objects of the SOCIETY are to promote the Arts, Manufactures, and Commerce of this kingdom, by giving rewards for all such useful Inventions, Discoveries, and Improvements (though not mentioned in this book), as tend to that purpose; and, in pursuance of this plan, the SOCIETY have already expended upwards of FIFTY THOUSAND POUNDS, advanced by voluntary subscriptions of their members, and legacies bequeathed.

The manner in which this money has been distributed may be seen by applying to the Secretary or other officers of the SOCIETY, at their house in the *Adelphi*. The Register of the Premiums and Bounties they have given will show the very great advantages which the Public have derived from this Institution.

The meetings of the SOCIETY are held every *Wednesday*, at seven o'clock in the evening, from the fourth *Wednesday* in *October* to the first *Wednesday* in *June*. The several Committees meet on other evenings in the week during the session.

In order still farther to promote the laudable views of this SOCIETY, it may be necessary to explain the mode by which its members continue to be elected.

Each member has the privilege, at any weekly meeting of the SOCIETY, of proposing any person who is desirous to become a member, provided such proposal is signed by three members of the SOCIETY.

Peers of the Realm or Lords of Parliament are, on their being proposed, immediately balloted for; and the name, with the addition and place of abode, of every other person proposing to become a member, is to be delivered to the Secretary, who is to read the same, and properly insert the name in a list, which is to be hung up in the SOCIETY's room until the next meeting: at which time such person shall be balloted for; and, if two thirds of the members, then voting, ballot in his favour, he shall be deemed a *perpetual member*, upon payment of not less than *Twenty Guineas* at one payment; or, a *subscribing member*, upon payment of any sum not less than *Two Guineas* annually.

Every member is entitled to vote, and assist in all the transactions of the SOCIETY, and its several Committees. He has also the privilege of recommending two persons as Auditors, at the weekly meeting of the SOCIETY; and, by addressing a note to the Housekeeper, of introducing his friends to examine the various models, machines, and productions, in different branches of arts, manufactures, and commerce, for which rewards have been bestowed; and to inspect the magnificent series of moral and historical paintings, so happily contrived and completed by JAMES BARRY, Esq. which, with some valuable busts and statues, decorate the Great Room. He has likewise the use of a select Library; and is entitled to the annual Volume of the SOCIETY's Transactions.

The time appointed for admission to the paintings or models, is from ten to two o'clock, Sundays and Wednesdays excepted.

PREMIUMS IN AGRICULTURE.

Article 1. ACORNS.

FOR having set, between the first of October, 1803, and the first of April, 1804, the greatest quantity of land, not less than ten acres, with acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

2. For the second greatest quantity of land, not less than five acres, set agreeably to the above conditions, the silver medal.

Certificates of setting agreeably to the above conditions, and that there are not fewer than three hundred young oaks on each acre, to be delivered to the Society on or before the first Tuesday in December, 1805.

3. RAISING OAKS. To the person who shall have raised, since the year 1801, the greatest number of oaks, not fewer than five thousand, either from young plants or acorns, in order to secure a succession of oak timber in this kingdom; the gold medal.

4. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates that there were on the land, at least the number of young oak-trees required, in a thriving condition, two years after the planting, with an account of the methods pursued in making and managing the plantation,

to be produced to the Society on or before the first Tuesday in January, 1806.

5. Ascertaining the best Method of raising Oaks. To the person who shall ascertain in the best manner, by actual experiments, the comparative merits of the different modes of raising oaks for timber, either from acorns set on land properly dug or tilled, from acorns set by the spade or dibble, without digging or tillage, either on a smooth surface, or among bushes, fern, or other cover; or from young plants, previously raised in nurseries, and transplanted; regard being had to the expense, growth, and other respective advantages of the several methods; the gold medal.

The *accounts*, and proper *certificates* that not less than one acre has been cultivated in each mode, to be produced to the Society on or before the first Tuesday in November, 1805.

6. Chesnuts. For having sown or set, between the first of October, 1803, and the first of April, 1804, the greatest quantity of dry loamy land, not less than six acres, with Spanish chesnuts, with or without seeds, cuttings, or plants of other trees, adapted to such soil, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

7. For the second greatest quantity, not less than four acres, the silver medal.

Certificates of sowing or setting, agreeably to the above conditions, and that there are not fewer than three hundred chesnut plants, in a thriving state, on each acre, to be delivered to the Society on or before the first Tuesday in January, 1806.

8. Elm. For having planted the greatest number of the English elm, not less than eight thousand, between the twenty-fourth of June, 1803, and the twenty-fourth of June, 1804; and for having effectually fenced and preserved the same in order to raise timber; the gold medal.

9. For the second greatest number, not less than five thousand, the silver medal.

Certificates of having planted agreeably to the above conditions, that the plants were in a healthy and thriving state two years at least after making the plantation, and specifying the distance of the plants, to be delivered to the Society on or before the first Tuesday in April, 1806.

10. Larch. For having planted out, between the twenty-fourth of June, 1802, and the twenty-fourth of June, 1803, the greatest number of larch-trees, not fewer than five thousand; and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

11. For the next greatest number, not fewer than three thousand, the silver medal.

Certificates of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the last Tuesday in December, 1805.

N.B. The larch-trees may be either planted, mixed with other trees, or by themselves, as may best suit the convenience of the planter.

12. Osiers. To the person who shall have planted, between the first of October, 1804, and the first of May, 1805, the greatest quantity of land, not less than five acres, with those kinds of willows, commonly known by the names of osier, Spaniard, new kind, or French, fit for the purpose of basket-makers, not fewer than twelve thousand plants on each acre; the gold medal.

13. For the second greatest quantity of land, not less than three acres, the silver medal.

Certificates of the planting, and that the plants were in a thriving state five months at least after the planting, to be produced to the Society on or before the last Tuesday in November, 1805.

14. Alder. For having planted, in the year 1802, the greatest number of alders, not less than three thousand; the gold medal.

Certificates of the number of plants, and that they were in a thriving state two years at least after being planted, to be delivered to the Society on or before the last Tuesday in December, 1805.

15. Ash. For having sown or set, in the year 1802, the greatest quantity of land, not less than six acres, with ash for timber, with or without seeds, cuttings, or plants, of such other trees as are adapted to the soil; the gold medal.

16. For the next greatest quantity, not less than four acres, the silver medal.

Certificates of the sowing or setting, agreeably to the above conditions, that there are not fewer than one hundred ash plants on each acre, in a thriving and healthy condition, two years at least after the sowing or setting, with a general account of the methods used in making the plantation; to be delivered to the Society on or before the last Tuesday in December, 1805.

N.B. *It is the particular wish of the Society, that such lands only as are not calculated for growing corn, should be employed for the purposes specified in these advertisements.*

17. Forest-trees. To the person who shall have enclosed and planted, or set, the greatest number of acres (not less than ten) of land, that is incapable of being ploughed, such as the borders of rivers, the sides of precipices, and any land that has too many rocks, or that is not calculated to repay the expense of tillage, owing to the stiffness or poverty of the

soil, the surface being too hilly, mountainous, or otherwise unfit for tillage, with the best sorts of forest-trees, namely, oak, Spanish chesnuts, ash, elm, beech, alder, willow, larch, spruce, and silver fir, with or without screens of Scotch fir, adapted to the soil, and intended for timber-trees, between the first of October, 1802, and the first of April, 1803; the gold medal.

18. For the second greatest quantity of land, not less than seven acres; the silver medal, or ten guineas.

19. For the third greatest quantity of land, not less than five acres, the silver medal. A particular *account* of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper *certificates* that they were in a healthy and thriving state two years at least after making the plantation, to be delivered to the Society on or before the first Tuesday in November, 1805.

N.B. With the above forest-trees, the seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

The candidates for planting all kinds of trees are to produce certificates that the respective plantations are properly fenced and secured, and particularly to state the condition of the plants at the time of signing such certificates. Any information which the candidates for the foregoing premiums may choose to communicate, relative to the methods made use of in forming the plantations, or promoting the growth of the several trees, or any other observations that may have occurred on the subject, will be thankfully received.

20. Securing Plantations of Timber-trees, and Hedge-rows. To the person who shall give to the Society the most satisfactory account, founded on experience, of the most effectual and least expensive method of securing young plantations of timber-trees, and hedge-rows, from hares and rabbits, as well as sheep and larger cattle, which at the same time shall be least subject to the depredations of wood-stealers; the silver medal, or ten guineas. The *accounts*, and *certificates* of the efficacy of the method, to be produced to the Society on or before the first Tuesday in November, 1805.

21. Comparative Tillage. For the most satisfactory set of experiments, made on not less than eight acres of land, four of which to be trench-ploughed,* and four to be ploughed in the usual manner, in order to ascertain in what cases it may be advisable to shorten the operation of tillage, by adopting one trench-ploughing, for the purpose of burying the weeds, instead of the method now in common use, of ploughing and harrowing the land three or four times, and raking the weeds together and burning them; the gold medal. It is required that every operation and expense attending each mode of culture be fully and accurately described, and that proper *certificates* of the nature and condition of the land on which the experiments are made, together with a circumstantial account of the appearance of the subsequent crops during their growth; and also of the quantity and weight of the corn and straw under each mode of culture, or, in case of a green crop, the weight of an average sixteen perches, be produced to the Society on or before the first Tuesday in February, 1806.

22. Comparative Culture of Wheat broad-cast, drilled, and dibbled. For the best set of experiments, made on not less than twelve acres, four of which to be sown broad-cast, four drilled, and four dibbled, the two latter in equidistant rows, in order fully to ascertain which is the most advantageous mode of cultivating wheat; the gold medal, or thirty guineas. It is required that every operation and expense of each mode of culture be fully described; and that proper *certificates* of the nature and condition of the land on which the experiments are made, together with an *account* of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the first Tuesday in February, 1806.

23. Spring Wheat. To the person who, between the 10th of January and the 10th of April, 1804, shall cultivate the greatest quantity of wheat, not less than ten acres; the gold medal. It is required that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, with proper *certificates* of the nature and condition of the land on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding year; together with an *account* of the produce, the weight per Winchester bushel, and a sample, not less than a quart, be produced to the Society on or before the second Tuesday in February, 1806.

It is supposed that sowing wheat early in the spring will not only allow more time to till the land, but less for the growth of weeds; thus rendering the wheat as clean as a barley crop, and exhausting the soil much less than autumnal sowing. It may be seen in the 19th volume, that the wheat usually sown in autumn may be put into the ground, with great success, so late as February or March, thus giving time to clear the ground from turnips, or to avoid a bad season.

* It is a common practice among gardeners, when they have a piece of very foul land, to dig it two spits, or about eighteen inches deep, shovelling the weeds to the bottom. This they call trenching.

24. Beans and Wheat. To the person who shall have dibbled or drilled, between the 1st of December, 1804, and the 1st of April, 1805, the greatest quantity of land, not less than ten acres, with beans, in equidistant rows, and hoed the intervals twice or oftener, and shall have sown the same land with wheat in the autumn of the year 1805; the gold medal. It is required that an *account* of the sort and quantity of beans, the time of dibbling or drilling, and of reaping or mowing them, the produce per acre thrashed, the expense of dibbling or drilling, hand or horse hoeing, the distance of the rows, and the quality of the soil, together with *certificates* of the number of acres, and that the land was afterwards actually sown with wheat, be produced on or before the second Tuesday in March, 1806.

25. Beans. To the person who, in the year 1804, shall discover and cultivate, either by the drill or dibbling method, on not less than five acres, a species of horse-beans or tick-beans, that will ripen their seeds before the 21st of August; the silver medal, or ten guineas. It is required that a particular account of the bean, the cultivation, and the expense attending it, with proper *certificates* of the nature and condition of the land on which the experiments are made, together with an *account* of the produce, the weight per Winchester bushel, and a sample of not less than a quart, be produced to the Society on or before the first Tuesday in December, 1805. It is apprehended that, if a bean should be brought into cultivation with the habits of the hotspur, or other early peas, that it would, in a great measure, escape the danger arising from the collier-insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat. The *accounts* and *certificates* to be delivered on or before the first Tuesday in December, 1805.

26. Comparative Culture of Turnips. For the best set of experiments made on not less than eight acres of land, four of which to be sown broad-cast, and four drilled, to ascertain whether it is most advantageous to cultivate turnips by sowing them broadcast and hand-hoeing them, or by drilling them in equidistant rows, and hand or horse hoeing the intervals; the silver medal, or ten guineas. It is required, that every operation and expense of each mode of culture be fully described, and that proper *certificates* of the nature and condition of the land on which the experiments were made, together with the weight of the turnips grown, on a fair average sixteen perches of land, under each mode of culture, be produced to the Society on or before the first Tuesday in March, 1806. The object which the Society have in view in offering this premium is experimentally to ascertain the most advantageous method of growing turnips. To do this in a satisfactory manner, both the drilled and broad cast crops should have the advantage of the most perfect cultivation, consequently the drilled crops should have the intervals between the rows worked by the horse or hand hoe, or by both these implements; and the rows should be either weeded or hand-hoed, or both weeded and hand-hoed. The broadcast crop should have every advantage which weeding and hand-hoeing can give it, consistently with leaving the soil a flat surface.

27. Parsnips. To the person who, in the year 1805, shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the sole purpose of feeding cattle or sheep; the gold medal. *Certificates* of the quantity of land so cultivated, with a particular *account* of the nature of the soil and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the parsnips, and the advantages resulting from the practice, to be produced to the Society on or before the second day in February, 1806.

28. Buck Wheat. To the person who shall cultivate the greatest quantity of land with buck wheat, not less than thirty acres; the gold medal. It is required that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, the manner of reaping it, thrashing it, and housing the grain; with proper *certificates* of the nature and condition of the land on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding year, together with an *account* of the produce, and a sample of the seed, not less than a quart, be produced to the Society on or before the second Tuesday in January, 1806.

29. For the next greatest quantity, not less than fifteen acres, on similar conditions; the silver medal. Information respecting its application to the feeding of cattle, hogs, and poultry, and other of its uses, is also desired. It is known to be particularly serviceable in furnishing honey to bees.

30. Raising Grass Seeds. To the person who shall raise the greatest quantity of each of any of the following named grass seeds, *viz.*—Meadow fox-tail (alopecurus pratensis), sweet-scented vernal grass (anthoxanthum odoratum), Timothy grass, meadow Fescue grass, smooth-stalked meadow grass (poa pratensis), rough-stalked meadow grass (poa trivialis); the silver medal, or ten guineas. It is required that *certificates* from persons who have viewed them in a proper state, to identify that they are one or other of the seeds above mentioned, indicating clearly the

particular species, and noticing the quantity produced of such seeds, free from weeds or mixture of other grasses, together with proper samples of the seeds, be produced to the Society on or before the 1st day of February, 1806.

31. Rotation of Crops. To the person who shall, between the 10th of August, 1802, and the 10th of September, 1804, cultivate the greatest quantity of land, not less than forty acres, in the following rotation, *viz.* 1st, winter tares; 2d, turnips; and 3d, wheat; and apply the two former crops in the best and most farmer-like manner, to the rearing, supporting, and fattening horses, cattle, sheep, or hogs, on the land which produced the crops; the gold medal, or one hundred guineas.

32. For the next in quantity and merit, on not less than thirty acres, the silver medal, or fifty guineas.

33. For the next in quantity and merit, on not less than twenty acres, the silver medal. It is required, that every operation and expense be fully described, and that satisfactory *certificates* of the nature and condition of the soil on which the crops have grown, together with an *account* of their appearance, the number of horses and cattle, sheep, or hogs fed by the two green crops, and, as near as possible, the improved value of the live stock by the consumption of those crops, and also the quantity of wheat per acre, and its weight per bushel, be produced to the Society on or before the first day of November, 1805.

It is presumed that very great advantage will arise to such agriculturists as shall adopt this rotation of crops on a dry soil. They will be enabled, with the addition of a few acres of turnip-rooted cabbage for spring-food, to keep such large flocks of sheep and herds of neat cattle as may secure a sufficient quantity of manure to fertilize their land in the highest degree, and in every situation. It is farther conceived, that wheats which will bear sowing in the spring will be particularly suitable for this premium.

34. Preserving Turnips. To the person who shall discover to the Society the best and cheapest method of preserving turnips perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle, during the months of February, March, and April; the silver medal, or ten guineas. It is required that a full and accurate *account* of the method employed, and the expense attending the process, together with *certificates* that the produce of four acres at the least have been preserved according to the method described, and applied to the feeding of sheep and neat cattle; that the whole were drawn out of the ground before the first day of February, in order to clear the greater part of it previous to its being prepared for corn, and to save the soil from being exhausted by the turnips; and also of the weight of an average sixteen perches of the crop; be produced to the Society on or before the first Tuesday in November, 1805.

N.B. *It is recommended to those who may be induced to try the necessary experiments for obtaining this and the following four premiums, to consider the method employed for the preservation of potatoes in ridges (which the growers call pies), and also the propriety of adopting a similar method in cases where they are previously frozen. It is supposed that, in the latter instance, the addition of ice or snow, and the construction of ridges upon a large scale, may be sufficient to preserve the freezing temperature till the vegetables are wanted for the use of cattle or sheep, at which time they may be thawed by immersion in cold water, and the* rot *which a sudden thaw produces may be prevented.*

35. For the next in quantity and merit, on not less than two acres, the silver medal.

36. Preserving Cabbages. To the person who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal, or thirty guineas.

37. For the next in quantity and merit, on not less than two acres, the silver medal or fifteen guineas. Conditions the same as for preserving turnips, Art. 34. And the *accounts* to be produced on or before the first Tuesday in November, 1805.

38. Preserving Carrots, Parsnips, or Beets. To the person who shall discover to the Society the best and cheapest method of preserving carrots, parsnips, or beets, perfectly sound, and in every respect fit for the purpose of supporting horses, and fattening sheep and neat cattle, during the months of February, March, and April; the silver medal, or fifteen guineas. Conditions the same as for preserving turnips, Art. 34. And the *accounts* to be delivered in on or before the first day in November, 1805.

39. Preserving Potatoes. To the person who shall discover to the Society the best and cheapest method of preserving potatoes, two or more years, perfectly sound, without vegetating, and in every other respect fit for the purpose of sets and the use of the table, and, consequently, of supporting and fattening cattle; the gold medal, or thirty guineas. It is required, that a full and accurate *account* of the method employed, and the expense attending the process, with *certificates*

that one hundred bushels at the least have been preserved according to the method described, and that one or more bushels of the same potatoes have been set, and produced a crop without any apparent diminution of their vegetative power, and also that they have been used at table, with entire satisfaction to the person who ate of them, together with a sample of one bushel, be sent to the Society on or before the first Tuesday in November, 1805.

40. Making Meadow-Hay in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of making meadow-hay in wet weather; the gold medal, or thirty guineas. A full *account* of the method employed, and of the expense attending the process, with not less than fifty-six pounds of the hay; and *certificates* that at least the produce of six acres of land has been made according to the method described, and that the whole is of equal quality with the sample; to be produced on or before the first Tuesday in January, 1806.

41 Harvesting Corn in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet weather; the gold medal, or thirty guineas. A full *account* of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and *certificates* that at least the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples, to be produced on or before the first Tuesday in January, 1806.

42. Ascertaining the component Parts of arable Land. To the person who shall produce to the Society the most satisfactory set of experiments to ascertain the due proportion of the several component parts of rich arable land, in one or more counties in Great Britain, by an accurate analysis of it; and who, having made a like analysis of some poor arable land, shall, by comparing the component parts of each, and thereby ascertaining the deficiencies of the poor soil, improve a quantity of it, not less than one acre, by the addition of such parts as the former experiments shall have discovered to be wanting therein, and therefore probably the cause of its sterility; the gold medal, or forty guineas. It is required, that the manurings, ploughings, and crops, of the improved land, be the same after the improvement as before; and that a minute *account* of the produce in each state, of the weather, and of the various influencing circumstances, together with the method made use of in analysing the soils, be produced, with proper *certificates* and the chemical results of the analysis, which are to remain the property of the Society, on or before the last Tuesday in February, 1806.

It is expected that a quantity, not less than six pounds, of the rich, of the poor, and of the improved soils, be produced with the *certificates*.

43. Gaining Land from the Sea. To the person who shall produce to the Society an account, verified by actual experiment, of his having gained the greatest quantity of land from the sea, not less than fifty acres, on the coast of Great Britain or Ireland; the gold medal. *Certificates* of the quantity of land, and that the experiments were begun after the 1st of January, 1799, to be produced to the Society on or before the last Tuesday in October, 1805.

44. The same premium is extended one year farther. *Certificates* to be produced on or before the last Tuesday in October, 1806.

45. Improving Land lying waste. For the most satisfactory *account* of the best method of improving any of the following soils, being land lying waste or uncultivated, *viz.* clay, gravel, sand, chalk, peat-earth and bog, verified by experiments on not less than fifty acres of land; the gold medal, or thirty guineas.

46. For the next greatest quantity, not less than thirty acres, the silver medal, or twenty guineas. It is required, that the land, before such improvement, be absolutely uncultivated, and in a great measure useless, and that, in its improved state, it be enclosed, cultivated, and divided into closes. *Certificates* of the number of acres, of the quality of the land so improved, with a full *account* of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced on or before the first Tuesday in February, 1806.

47. Manures. For the most satisfactory set of experiments, to ascertain the comparative advantages of the following manures, used as top-dressings on grass and corn land, viz. soot, coal-ashes, wood-ashes, lime, gypsum, night-soil, or any other fit article; the gold medal, or the silver medal and ten guineas. It is required that the above experiments be made between two or more of the above-mentioned manures, and that no less than two acres of land be dressed with each manure. An *account* of the nature of the soil, quantity and expense of the manure and crops, with *certificates*, to be produced on or before the last Tuesday in February, 1806.

48. Raising Water for the Irrigation of Land. To the person who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for

the purpose of irrigating land, superior to, and cheaper than any other method now in use; the gold medal, or fifty guineas. A model on a scale of one inch to a foot, with *certificates* that a machine at large, on the same construction, has been used, specifying the quantity of water delivered in gallons per hour, and the height to which it was raised, to be produced to the Society on or before the first of March, 1806.

49. Paring Plough. To the person who shall invent and produce to the Society, a machine or plough for the purpose of paring land preparatory to burning, superior to any hitherto known or in use for such purpose, and to be worked by not more than one man and two horses; the silver medal, or twenty guineas. The machine, and *certificates* that at least three acres have been pared by it in a proper manner, to be produced to the Society on or before the first of January, 1806.

50. Machine for Dibbling Wheat. To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances, and proper depths; the silver medal and ten guineas. The *machine*, with *certificates* that at least three acres have been dibbled by it, to be produced to the Society on or before the second Tuesday in January, 1806.

51. Machine for Reaping or Mowing Corn. For inventing a machine to answer the purpose of mowing or reaping wheat, rye, barley, oats, or beans, by which it may be done more expeditiously and cheaper than by any method now practised, provided it does not shed the corn or pulse more than the methods in common practice, and that it lays the straw in such a manner that it may be easily gathered up for binding; the gold medal, or thirty guineas. The *machine*, with *certificates* that at least three acres have been cut by it, to be produced to the Society on or before the second Tuesday in December, 1805. Simplicity and cheapness in the construction of this and the preceding machine, will be considered as principal parts of their merit.

52. Thrashing Machine. To the person who shall invent a machine by which corn of all sorts may be thrashed more expeditiously, effectually, and at a less expense, than by any method now in use; the gold medal, or thirty guineas. The *machine*, or a model, with proper *certificates* that such a machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1806.

53. Destroying the Grub of the Cockchafer. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying the grub of the cockchafer, or of preventing or checking the destructive effects which always attend corn, peas, beans, and turnips, when attacked by those insects; the gold medal, or thirty guineas. The *accounts*, with proper *certificates*, to be produced on or before the first Tuesday in January, 1806.

54. Destroying Worms. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying worms, or of preventing the destructive effects they occasion on corn, beans, peas, or other pulse; the gold medal, or thirty guineas. The *accounts*, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1806.

55. Destroying the Fly on Hops. To the person who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known or practised, on not less than four acres of hop-ground; the gold medal, or thirty guineas. *Accounts* and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1806.

56. Preventing the Blight, or Ravages of Insects, on Fruit-Trees and Culinary Plants. To the person who shall discover to the Society the most effectual method of preventing the blight or ravages of insects on fruit-trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments; the gold medal, or thirty guineas. The *accounts*, with proper *certificates*, to be delivered to the Society on or before the second Tuesday in November, 1805.

57. Removing the ill Effects of Blights, or Insects. To the person who shall discover to the Society the most effectual method of removing the ill effects of blights, or insects, on fruit-trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments; the gold medal, or thirty guineas. The *accounts* and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1806.

58. Cure of the Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments; the gold medal, or fifty guineas. It is expected that the candidates furnish accurate *accounts* of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper *certificates*, must be delivered to the

Society on or before the first Tuesday in February, 1806.

59. Cure of the Foot-Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the foot-rot in sheep; the silver medal, or ten guineas. It is required, that the cure be ascertained by repeated and satisfactory experiments, and the method of performing it be verified by proper *certificates* delivered to the Society on or before the first Tuesday in February, 1806.

60. Preventing the ill Effects of Flies on Sheep. To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies; the silver medal, or ten guineas. It is required, that the method be ascertained by repeated experiments, and that a *certificate* of its efficacy be delivered to the Society on or before the first Tuesday in December, 1805.

61. Protecting Sheep. To the person who, in the year 1804, shall protect the greatest number of sheep, not fewer than one hundred, by hovels, sheds, or any other means, and give the most satisfactory account, verified by experiment, of the advantages arising from the practice of protecting sheep from the inclemency of the weather, by hovels, sheds, or any other means; the silver medal, or twenty guineas. A particular *account* of the experiments made, with the advantages arising therefrom, together with the expense, and *certificates* of its utility, to be produced to the Society on or before the first Tuesday in March, 1806.

N. B. It is required that the *certificates* shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time; together with the general method of managing them.

62. Improving the Condition of the labouring Poor, by erecting Cottages, and apportioning Land. To the person who, in the year 1804, shall erect the greatest number of cottages for the accommodation of the labouring poor, and apportion not less than two acres of land to each cottage; the gold medal. The *accounts* and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1806.

63. Improving the Condition of the labouring Poor by apportioning Land to Cottages. To the person who, in the year 1804, shall apportion to the greatest number of cottages already built upon his or her estate, any quantity of land, not less than two acres to each cottage, for the better accommodation of the respective inhabitants; the gold medal. The *accounts* of the number of cottages, and of the quantity of land apportioned to each, to be delivered to the Society, with proper *certificates*, on or before the first Tuesday in February, 1806.

64. Culture of Hemp in certain parts of Scotland. The Society wishing to encourage the growth of hemp for the use of the navy in certain parts of Scotland, comprehending the whole county of Argyle, that part of Perthshire situated to the north of the river Tay, and west of the Military Road (see Ainslie's Map of Scotland) leading from Logierait to the county of Inverness, and such other parts of Scotland as lie north of Inverness-shire, offers to the person who shall sow with hemp, in drills at least eighteen inches asunder, the greatest quantity of land in the above-mentioned district, not less than fifty acres statute measure, in the year 1805, and shall at the proper season cause to be plucked the summer hemp (or male hemp bearing no seed), and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe; the gold medal, or fifty guineas.

65. To the person who shall sow with hemp, in drills at least eighteen inches asunder, the next greatest quantity of land in the same above-mentioned district, not less than twenty-five acres, statute measure, in the year 1805, and shall at the proper season cause the same to be plucked as above-mentioned; the silver medal, or twenty-five guineas. *Certificates* of the number of acres, of the distance of the drills, of the plucking of the hemp, with a general *account* of the soil, cultivation, and produce, to be delivered to the Society, along with fourteen pounds of the hemp, and two quarts of the seed, on or before the second Tuesday in January, 1806.

PREMIUMS FOR DISCOVERIES AND IMPROVEMENTS IN CHEMISTRY, DYING, AND MINERALOGY.

66. Preserving Seeds of Vegetables. For the best methods of preserving the seeds of plants in a state fit for vegetation a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the first Tuesday in December, 1805; the gold medal, or thirty guineas.

67. Preventing the Dry-rot in Timber. To the person who shall discover to the Society the cause of the dry-rot in timber, and disclose a certain method of prevention superior to any hitherto known; the gold medal, or thirty guineas. The *accounts* of the cause, and method of prevention, confirmed by repeated experiments, to be produced to the Society on before the second Tuesday in December, 1805.

68. Preserving salted Provisions

FROM BECOMING RANCID OR RUSTY. To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from growing rancid or rusty; the gold medal, or thirty guineas. A full *description* of the method, with proper *certificates* that it has been found, on repeated trials, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1806.

69. REFINING WHALE OR SEAL OIL. For disclosing to the Society an effectual method of purifying whale or seal oil from the glutinous matter that incrusts the wicks of lamps, and extinguishes the light, though fully supplied with oil; the gold medal, or fifty guineas. It is required, that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society to determine the validity of the claim; and *certificates* that not less than twenty gallons have been purified according to the process delivered in, together with two gallons of the oil, in its unpurified state, and two gallons so refined, to be produced to the Society on or before the second Tuesday in February, 1806.

70. MANUFACTURING TALLOW CANDLES. To the person who shall discover to the Society a method of hardening or otherwise preparing tallow, so that candles may be made of it which will burn as clear and with as small a wick as wax candles, without running, and may be afforded at a less expense than any at present made with spermaceti; the gold medal, or thirty guineas. *Certificates* that 112lb. of such tallow have been made into candles, and 12lb. of the candles made thereof, to be produced to the Society on or before the second Tuesday in January, 1806.

71. CANDLES FROM RESIN OR OTHER SUBSTANCES. To the person who shall discover to the Society the best method of making candles of resin, or any other substance, fit for common use, at a price much inferior to those made of tallow only; the gold medal, or thirty guineas. Six pounds at least of the candles so prepared, with an *account* of the process, to be delivered to the Society on or before the first Tuesday in December, 1805.

72. METHOD OF SEPARATING SUGAR IN A SOLID FORM FROM TREACLE. To the person who shall discover to the Society the best method of separating sugar from treacle, in a solid form, at such an expense as will render it advantageous to the public; the gold medal, or fifty guineas. A quantity of the sugar so prepared, in a solid form, not less than thirty pounds weight, with an *account* of the process, and *certificates* that not less than one hundred weight has been prepared, to be produced to the Society on or before the first Tuesday in February, 1806.

73. INCREASING STEAM. To the person who shall invent and discover to the Society a method, verified by actual experiments, of increasing the quantity or force of steam, in steam-engines, with less fuel than has hitherto been employed, provided that in general the whole amount of the expenses in using steam-engines may be considerably lessened; the gold medal, or thirty guineas. To be communicated to the Society on or before the first Tuesday in January, 1806.

74. SUBSTITUTE FOR TAR. To the person who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind, and prepared from materials the produce of Great Britain; the gold medal, or one hundred guineas. A quantity of the substitute, not less than one hundred weight, with *certificates* that at least one ton has been manufactured, and that it can be afforded at a price not exceeding that of the best foreign tar, together with an *account* of the process, to be delivered to the Society on or before the first Tuesday in March, 1806.

75. PREPARATION OF TAN. To the person who shall prepare in the most concentrated form, so as to be easily portable, and at a price applicable to the purposes of manufacturers, the largest quantity, not less than one hundred weight, of the principle called by the French *tannin*, which abounds in oak-bark and many other vegetable substances; the gold medal, or thirty guineas. *Certificates* of the superior quality of the quantity so prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1806.

76. INDELIBLE INK. To the person who shall discover to the Society, a method of making a black ink proper for writing, superior to any at present known, indestructible by chemical applications, and not dearer than that which is now in common use; the silver medal, or fifteen guineas. *Certificates* that not less than two gallons of such ink have been actually prepared, and found to possess the qualities above mentioned, with a full detail of the process of making it, and two quarts of the ink, to be delivered to the Society on or before the second Tuesday in January, 1806.

77. PREPARATION OF A RED STAIN FOR COTTON CLOTH. To the person who shall communicate to the Society, the cheapest and most effectual method of printing or staining cotton cloths with a red colour, by an immediate application of the colouring matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder; the gold medal or

thirty guineas. *Certificates* that the above process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length, one piece of the calico so printed, a quart of the colour in a liquid state, and a full *account* of the preparation and application, to be produced to the Society on or before the second Tuesday in January, 1806.

78. Preparation of a green Colour for printing Cotton Cloth. To the person who shall communicate to the Society the best and cheapest method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld on alumine and the solutions of indigo by earths or alkaline salts; the gold medal, or thirty guineas. *Certificates* and conditions as for premium 77.

79. Rendering Muslin less combustible. To the person who shall discover to the Society a method of rendering muslin less combustible, to be effected by a cheaper and more effectual mode than any hitherto known; the silver medal.

Specimens of the muslin so prepared, with a full account of the process employed for the purpose, to be produced to the Society on or before the first Tuesday in February, 1806.

N. B. It is expected that the means employed should neither injure the quality nor stain the muslin, nor damage any print or dye with which it may be coloured.

80. Substitute for the Basis of Paint. To the person who shall produce to the Society the best substitute, superior to any hitherto known, for the basis of paint, equally proper for the purpose as the white lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white lead; the gold medal, or one hundred guineas. A quantity of the substitute, not less than 50lb. weight, with an *account* of the process used in preparing it, and *certificates* that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in January, 1806.

81. Red Pigment. To the person who shall discover to the Society a full and satisfactory process for preparing a red pigment, fit for use, in oil and water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable; the gold medal, or thirty guineas. One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in Feb. 1806.

N. B. It is not required that the colour should resist the action of fire or chemical applications, but remain unaltered by the common exposure to strong light, damps, and noisome vapours.

82. Ultramarine. To the person who shall prepare an artificial ultramarine, equal in colour, brilliancy, or durability, to the best prepared from lapis lazuli, and which may be afforded at a cheap rate; the gold medal, or thirty guineas. The conditions are the same as in the preceding premium for the red pigment.

83. Statuary Marble. To the person who shall discover, within Great Britain or Ireland, a quarry of white marble fit for the purposes of statuary, and equal in all respects to those kinds now imported from Italy; the gold medal, or one hundred pounds. A block of at least three feet in length, two in height, and two in width, with an account of the situation of the quarry, and *certificates* of its possessing considerable extent, to be produced to the Society on or before the first Tuesday in February, 1806.

N. B. In order to prevent useless expense or trouble to the claimant in forwarding so large a block, the Society will be ready to examine any smaller specimen of the marble, and express their opinion of its value to the candidate before the block required by the above premium is produced.

84. Preparation of Sulphuric Acid from Sulphur without the Use of any Nitric Salt. To the person who shall prepare the largest quantity (not less than one ton) of sulphuric acid from sulphur, without any nitric salt, of a specific gravity, not inferior to the best sulphuric acid of commerce; the gold medal, or fifty guineas. *Certificates* that not less than the above quantity of such an acid has been prepared, together with a sample, to be produced to the Society on or before the first Tuesday in January, 1806.

85. Preparation of any alkaline or earthy Nitrate. To the person who shall prepare, in Great-Britain, the largest quantity, not less than one hundred weight, of any salt of nitric acid, with either earths or alkalis, by a method superior to, and as cheap as those hitherto practised; the gold medal, or one hundred guineas. *Certificates* of the above quantity having been prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1806.

86. Fine Bar-Iron. To the person, in Great-Britain, who shall make the greatest quantity of bar-iron, not less than ten tons, with coak, from coak-pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for converting into steel; the gold medal, or fifty guineas. Samples, not

less than one hundred weight, with *certificates* that the whole quantity is of equal quality, to be produced to the Society on or before the first Tuesday in January, 1806.

87. Preserving Iron from Rust. To the person who shall invent and discover to the Society a cheap composition, superior to any now in use, which shall effectually preserve wrought iron from rust; the gold medal, or fifty guineas. A full description of the method of preparing the composition, with *certificates* that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with ten pounds weight of the composition, on or before the first Tuesday in January, 1806.

88. Refining Block-Tin. To the person who shall discover to the Society the best method of purifying or refining block-tin, so as to render it fit for the finest purposes to which grain-tin is now applied, and not higher in price; the gold medal, or fifty guineas. *Certificates* that not less than three tons have been so refined or purified, with a full detail of the process, and a quantity, not less than one hundred weight, of the tin so refined, to be produced to the Society on or before the first Tuesday in January, 1806.

89. Glazing Earthen-Ware without Lead. To the person who shall discover to the Society the cheapest, safest, most durable, and most easily fusible composition, fit for the purpose of glazing the ordinary kinds of earthen-ware, without any preparation of lead, and superior to any hitherto in use; the gold medal, or thirty guineas. Specimens of the ware so glazed, with proper *certificates* of its having succeeded, and a sample of the materials made use of, to be produced to the Society on or before the first Tuesday in February, 1806.

90. Refining Copper from the Ore. To the person who shall discover to the Society the best method of separating, purifying, and refining copper from the ore, so as to render it fit for the finest purposes to which fine copper is now applied, and by a process superior to any hitherto known or in use, and not higher in price; the gold medal, or fifty guineas. *Certificates* that not less than three tons have been so prepared or refined, and a quantity not less than one hundred weight of the copper so refined, to be produced to the Society on or before the first Tuesday in February, 1806.

91. Mineralogical Map of England and Wales. To the person who shall complete and publish an accurate mineralogical map of England and Wales, on a scale of not less than ten miles to an inch, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced; the gold medal, or fifty guineas. *Certificates* of the accuracy of such map, together with the map, to be produced to the Society on or before the first Tuesday in February, 1806. The map to remain the property of the Society.

92. Mineralogical Map of Ireland. The same premium is offered for a mineralogical map of Ireland, on similar conditions.

93. Mineralogical Map of Scotland. The same premium is offered for a mineralogical map of Scotland, on similar conditions.

94. Natural History. To the author who shall publish, in the year 1805, the natural history of any county in England or Wales; the gold medal, or fifty guineas. It is required that the several natural productions, whether animal, or vegetable, or mineral, peculiar to the county, or found therein, be carefully and specifically arranged and described, in order that the public may be enabled to judge what arts or manufactures are most likely to succeed in such county. The work to be delivered to the Society on or before the last Tuesday in January, 1806.

PREMIUMS IN POLITE ARTS.

95. Honorary Premiums for Drawing, by Nobility. For the best original drawing, of any kind, by young gentlemen under the age of twenty-one, sons or grandsons of peers or peeresses in their own right, of Great Britain or Ireland; the honorary medal of the Society in gold.

96. The same in silver for the best copy.

97. The same premiums will be given, on the like conditions, to young ladies, daughters or grand-daughters of peers or peeresses in their own right, of Great Britain or Ireland.

98. Honorary Premiums for Drawing, by Gentlemen. For the best original drawing, of any kind, by young gentlemen under the age of twenty-one; the gold medal.

99. For the best copy, the silver medal.

100. The same premiums will be given for drawings by young ladies.

N. B. As the foregoing honorary premiums are intended only for such of the nobility and gentry as may hereafter become patrons or patronesses of the arts; persons professing any branch of the polite arts, or any business dependent on the arts of design, or the sons or daughters of such persons, will not be admitted candidates in these classes.

101. Historical Drawings. For the best historical drawing, being an original composition of three or more human figures, the height of the principal figure not less than eight inches, by persons of either sex under twenty-one years of age; the gold pallet.

For the next in merit, the greater silver pallet.

102. Drawings or Outlines. For the best outline, after the plaster cast, of any antique statue, by persons of either sex under the age of twenty-one, the figure not less than eighteen inches; the greater silver pallet.

For the next in merit, the lesser silver pallet.

103. Paintings in Oil. For the best painting in oil, of a landscape after nature, the size thirty-six by twenty-eight inches, by persons of either sex under twenty-five years of age; the gold pallet.

For the next in merit, the great silver pallet. Each candidate must mention from whence the view was taken.

104. Drawings of Landscapes. For the best drawing, in water-colours, of a landscape after nature, not less than eighteen inches by twelve, by persons of either sex under twenty-one years of age; the gold pallet.

For the next in merit, the greater silver pallet.

Each candidate must mention whence the view was taken.

105. Drawings by Engravers. For the best finished drawing of any antique figure, the size of the drawing not less than eighteen inches, by persons under twenty-one years of age; the greater silver pallet.

For the next in merit, the lesser silver pallet.

106. Drawing and Engraving. To the person who shall complete the best original drawing and engraving, the design and engraving to be executed by the same artist; the gold medal. It is required that the drawing, and two impressions of the engraving, be produced, such impressions to remain the property of the Society.

107. Line Engravings of Historical Subjects. For the best historical engraving of any size; the gold pallet.

For the next in merit, the greater silver pallet.

108. Line Engravings of Landscapes. For the best line engraving of a landscape, the size of the engraving not limited; the gold pallet.

For the next in merit, the greater silver pallet.

N. B. It is not necessary, in the classes of line engravings, for the artist's name to be concealed. The first aquafortis proof of the above plates are required to be sent in with the finished impression, and *certificates* that the etchings are the entire work of the candidate. The aquafortis proof also to remain the property of the Society.

109. Perspective Drawings of Machines. For the best perspective drawings of machines, by persons under twenty-one years of age; the greater silver pallet.

110. Engraving on Wood or Metal Blocks, &c. For the best engraving on wood or metal blocks, or any other material, so that the same be rendered capable of composition with the letter-press, of any allegorical or other subject suited to the embellishment of letter-press; the gold pallet. Two or more impressions along with the block, to be produced to the Society. The impressions, but not the block, to remain the property of the Society.

111. Bronzes. For the best drapery figure or group cast in bronze; if a single figure, not less than twelve inches high; and if a group, not less than nine inches; and which will require the least additional labour to repair; the gold medal, or the silver medal and twenty guineas. The cast to be exhibited to the Society before it is begun to be repaired, with the original figure or group, together with a full explanation of the whole process.

112. Ornamental Drawings for Architectural Designs. For the best ornamental drawing for the purpose of embellishing architectural designs; a silver medallion with the following engraved inscription: *The Premium given by the Society for the Encouragement of Arts, Manufactures, and Commerce, in conformity to the Will of John Stock, of Hampstead, Esq.* The drawing to which the premium is adjudged to remain the property of the Society.

CONDITIONS
FOR THE POLITE ARTS.

All the claims under this class are to be produced to the Society on or before the last Tuesday in February, 1806.

No person who has gained the first premium in any class shall be admitted a candidate in a class of an inferior age; and no candidate shall receive more than one premium in one year; nor shall they who for two successive years have gained the first premium in one class, be again admitted as candidates in that class.

No person shall be admitted a candidate in any class, who has three times obtained the first premium in that class.

No more than one performance in any class shall be received from the same candidate.

All performances (to which premiums or bounties are adjudged) shall remain with the Society till after the first Wednesday in June, when they will be re-delivered, unless mentioned in the Premiums to the contrary.

No performance shall be admitted, that has obtained a premium, reward, or gratification, from any other society, academy, or school, or been offered for that purpose.

All performances that obtain premiums in the Polite Arts must have been begun after the publication of such premiums, except line engravings.

It is required, that the matters for which premiums are offered, be delivered in without names, or any intimation to whom they belong; that each particular thing be marked in what manner each claimant thinks fit, such claimant sending with it a paper sealed up, having on the outside a corresponding mark, and on the inside, the claimant's name, residence, and age; which paper is not to be opened unless the candidate be successful, or by a special vote of the Society.

To encourage real merit, and prevent attempts to impose on the Society, by producing drawings made or retouched by any other person than the candidate, the Society require a specimen of the abilities of each successful candidate, under the inspection of the Committee of Polite Arts, in every instance where such proof may appear necessary.

All candidates in the Polite Arts are required to signify, on their drawings, whether the performances are originals or copies; and if copies, whence they were taken.

PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

113. Machine for carding Silk. For the best machine, superior to any now in use, for carding waste silk equally well as by hand; to be produced, together with a specimen of the cardings, on or before the first Tuesday in November, 1805; the silver medal, or twenty guineas.

114. Cloth from Hop-Stalks, &c. To the person who shall produce to the Society the greatest quantity, not less than thirty yards of cloth at least twenty-seven inches wide, made in Great Britain, of hop-stalks or bines, or other raw vegetable substances, the produce of Great Britain or Ireland, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as cloth of equal quality and appearance now made from hemp, flax, or cotton, and much finer in quality than any hitherto manufactured in England from hop-stalks, &c. the gold medal, or thirty guineas. One pound of the thread of which the cloth is made, and thirty yards of the cloth, together with proper *certificates* that the whole is manufactured from hop-stalks or bines, &c. to be produced to the Society on or before the first Tuesday in December, 1805.

N. B. The Society is already in the possession of cloth made in England from hop-stalks or bines, which may be inspected by application to the Housekeeper.

115. Wicks for Candles or Lamps. To the person who shall discover to the Society a method of manufacturing hop-stalks or bines, or any other cheap material, the growth of Great Britain, so as to render them equally fit for the purpose of supplying the place of cotton, for wicks of candles or lamps; twenty guineas. Samples, not less than five pounds weight, of the wick so prepared, to be produced to the Society, with *certificates* that the whole quantity is equal in quality to the sample.

116. Paper from raw vegetable Substances. To the person in Great Britain, who shall, between the first of January, 1805, and the first of January, 1806, make the greatest quantity, and of the best quality (not less than ten reams), of good and useful paper, from raw vegetable substances, the produce of Great Britain or Ireland, of which one hundred weight has not been used in manufacturing paper previous to January, 1804, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as paper of equal quality and appearance now made from rags; twenty guineas.

N. B. The object of the Society being to add to the number and quantity of raw materials used in this manufacture, it is their wish to include every useful sort of paper, and to introduce such natural products as can be easily and cheaply procured in great quantities. The Society are in possession of two volumes containing a great variety of specimens of paper made from raw vegetable substances, viz.—nettles, potatoe-haum, poplar, hop-bines, &c. which volumes may be inspected by any person on application to the Housekeeper. *Certificates* of the making such paper, and one ream of the paper, to be produced.

117. Transparent Paper. To the person who shall discover to the Society a method of making paper from the pulp, that shall be perfectly transparent, and of a substance and body equal to foolscap, that shall take and bear common writing ink with the same facility and correctness as writing-paper generally in use; the silver medal, or twenty guineas. *Certificates* of the making such paper, an *account* of the process, and one ream of the paper to be produced.

118. Chints Patterns for Calico-Printers. For the best original pattern in a new taste, of light or dark-ground chints for garment-work, fit for the purposes of calico-printers, by persons of either sex; the gold medal. The pattern to which the premium is adjudged, to remain the property of the Society.

119. For the next in merit; the silver medal, on similar conditions.

120. Copper-plate Patterns for Calico-Printers. For the best pattern, in a new style, fit for the purposes of calico-printers for garment-work; the silver medal. The pattern to which the premium is adjudged, to remain the property of the Society.

PREMIUMS IN MECHANICS.

121. Gunpowder-Mills. To the person who, in the year 1805, shall invent and bring to perfection the most effectual method of so conducting the works of gunpowder-mills, in the business of making gunpowder, as to prevent explosion; the gold medal, or one hundred guineas. *Certificates* and *accounts* of the method having been put in practice in one or more gunpowder-mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in Feb. 1806.

N. B. As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of gunpowder making, which fall short of the total prevention of explosion, and they are sent to the Society for the sake of humanity, the papers so sent in will receive due consideration, and such bounty or reward will be bestowed therein as they appear to merit.

122. Transit-Instrument. To the person who shall invent and produce to the Society a cheap and portable transit-instrument, which may easily be converted into a zenith-sector, capable of being accurately and expeditiously adjusted for the purpose of finding the latitudes and longitudes of places, and superior to any portable transit-instrument now in use; the gold medal, or forty guineas. To be produced on or before the last Tuesday in January, 1806.

123. Taking Whales by the Gun-Harpoon. To the person who, in the year 1805, shall strike the greatest number of whales, not fewer than three, with the gun-harpoon; ten guineas. Proper *certificates* of the striking such whales, and that they were actually taken in the year 1805, signed by the master, or by the mate, when the claim is made by the master, to be produced to the Society on or before the last Tuesday in December, 1805.

124. Family Mill. To the person who shall invent and produce to the Society the best-constructed mill for grinding corn for the use of private families, or parish-poor; the construction to be such as to render the working of the mill easy and expeditious, and superior to any hitherto in use; the gold medal, or thirty guineas. The mill, and *certificates* of its having been used to good effect, to be produced to the Society on or before the first Tuesday in Feb. 1806. Cheapness and simplicity will be considered as essential parts of its merit; and the mill, or the model, to remain with the Society.

125. Machine for raising Coals, Ore, &c. &c. To the person who shall invent a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use; and which shall produce the effect at a less expense than those already known, or in use; the gold medal, or fifty guineas. A model of the machine, made on a scale of not less than one inch to a foot, with a *certificate* that a machine at large on the same construction has been advantageously used, to be produced to the Society on or before the second Tuesday in Feb. 1806.

126. Improved Walking-Wheel or Crane. To the person who shall invent an improved walking-wheel or crane, on which the weight and power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or lesser weight to be raised or lowered; the gold medal, or thirty guineas. The model, on a scale of not less than one inch to a foot, with a proper *certificate* that the machine at large has been employed to good effect, to be produced to the Society on or before the second Tuesday in February, 1806.

127. Machine for raising Water. To the person who shall invent a machine on a better, cheaper, and more simple construction than any hitherto known or in use, for raising water out of wells, &c. from a depth of not less than fifty feet; the gold medal, or forty guineas. *Certificates* of the performance of the machine, and a model of it, on a scale of not less than one inch to a foot, to be produced to the Society on or before the first Tuesday in February, 1806.

128. Elm Pipes. To the person who shall invent and discover to the Society a substitute for the elm pipes now in common use for the conveyance of water, which shall be cheaper, equally effectual, and more durable than any heretofore employed; the gold medal, or thirty guineas. It is required that one of the pipes so employed, an accurate *account* of the method used, and every expense attending it, together with satisfactory accounts of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1806.

129. Laying Wooden Pipes. To the person who shall invent and discover to the Society a superior method of laying or connecting the wooden pipes now in use for conveying water, so as to lessen the injury they receive thereby; the silver medal, or fifteen guineas.

It is required that a model, an accurate account of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1806.

130. Extinguishing Fires. To the person who shall produce to the Society the best and most effectual method of procuring an

immediate supply of water in case of fire, or for the means best calculated to prevent or extinguish accidental fires in buildings, superior to any now in use; the gold medal, or thirty guineas. *Certificates* of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the second Tuesday in January, 1806.

131. Boring and Blasting Rocks. To the person who shall discover to the Society a more simple, cheap, and expeditious method than any hitherto known or in use of boring or blasting rocks in mines, shafts, wells, &c.; the gold medal, or thirty guineas. *Certificates* of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the first Tuesday in January, 1806.

132. Heating Rooms for the purposes of Manufacturers. To the person who shall invent and discover to the Society a method of heating rooms, superior to any hitherto known or in use, and at a moderate expense, for the purposes of painters, japanners, and other manufacturers, so as to avoid the necessity of iron or copper tunnels going through the rooms to convey the smoke, whereby the danger from such tunnels may be prevented; the gold medal, or forty guineas. A model, or complete drawing and description of the method, with *certificates* that it has been successfully practised, to be delivered to the Society on or before the last Tuesday in March, 1806.

133. Improved Ventilation. To the person who shall invent and produce to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used; the gold medal, or fifty guineas. A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates*, to be delivered to the Society on or before the last Tuesday in February, 1806.

134. Preventing Accidents from Horses falling with two-wheeled Carriages. To the person who shall invent and produce to the Society a method superior to any hitherto known or in use, to prevent accidents from the falling of horses with two-wheeled carriages, especially on steep declivities; the silver medal, or fifteen guineas. A model of the apparatus, and a full account of the means by which the effect has been produced, with proper *certificates* that the same has been used with success, to be delivered to the Society on or before the second Tuesday in January, 1806.

135. Improving Turnpike and other Roads. To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiments, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat or any other mode, so as to form an even, hard, and durable carriage-road, not liable to be injured by heat or rain; the gold medal, or fifty guineas. It is required that an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the first Tuesday in March, 1806.

136. Cleansing Chimnies. To the person who shall invent and produce to the Society the most effectual mechanical or other means for cleansing chimnies from soot, and obviating the necessity of children being employed within the flues; the gold medal.

137. For the next in merit; the silver medal. The mechanical, or other means, with *certificates* of their having been used with proper effect, to be produced to the Society on or before the first Tuesday in January, 1806.

138. Chimnies Cleansed. To the person who shall during the year 1805 cleanse, or cause to be cleansed, the greatest number of chimnies, at least two stories high, not fewer than three hundred, by any mechanical or other process, which does not require the employment of boys within the flues; the gold medal. *Certificates*, signed by not less than two-thirds of those housekeepers on whose premises the said means have been employed, and an account of the process, to be produced to the Society on or before the first Tuesday in February, 1806.

139. To the person who shall cleanse, or cause to be cleansed, the next greatest number of chimnies, not fewer than one hundred and fifty, upon similar conditions to the above; the silver medal.

140. Raising the Bodies of Persons who have sunk under Water. To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water; the gold medal, or thirty guineas. The drag, or machine to answer the purpose intended, to be produced to the Society on or before the first Tuesday in March, 1806.

141. For preventing prejudicial effects to the persons employed in Pointing Needles. To the person who shall invent and produce to the Society a mode of obviating the prejudicial effects that attend the operation of pointing needles, by grinding them dry, during which the particles of grind-

stone dust and steel, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders; the gold medal, or thirty guineas. A model of the apparatus, and a full account of the means by which the effect has been produced, together with proper *certificates* of its practicability and adoption, to be delivered to the Society on or before the second Tuesday in March, 1806.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE.

142. Taking Porpoises. To the people in any boat or vessel, who, in the year 1805, shall take the greatest number of porpoises on the coast of Great Britain or Ireland, by gun, harpoon, or any other method, not fewer than thirty, for the purpose of extracting oil from them; the gold medal, or thirty pounds. *Certificates* of the number, signed by the persons to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in January, 1806.

143. Oil from Porpoises. To the person who shall manufacture the greatest quantity of oil from porpoises taken on the coast of Great Britain or Ireland, in the year 1805, not less than twenty tons; the gold medal, or thirty pounds. *Certificates* of the oil having been made from porpoises actually caught on the coast of Great Britain or Ireland, and two gallons of the oil as a sample, to be produced to the Society on or before the last Tuesday in February, 1806.

144. Curing Herrings by the Dutch Method. To the person or persons who shall, before January 1806, cure the greatest quantity of white herrings, not less than thirty barrels, according to the method practised by the Dutch, and equal in all respects to the best Dutch herrings, the same being caught in the British or Irish Seas, and cured in a British or Irish vessel or port; the gold medal, or fifty guineas.

145. For the next greatest quantity, not less than fifteen barrels: the silver medal, or twenty guineas. A sixteen-gallon barrel of the herrings to be produced to the Society on or before the first Tuesday in February, 1806, with *certificates* that the conditions of the premium have been completely fulfilled, and that the whole were cured in the same manner as the specimen, together with a full description of the process employed, in order that the Society may judge how far the Dutch method has been adopted.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH COLONIES.

146. Nutmegs. For the greatest quantity of merchantable nutmegs, not less than ten pounds weight, being the growth of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, and equal to those imported from the islands of the East Indies; the gold medal, or fifty guineas. Satisfactory *certificates*, from the governor, or commander in chief, of the place of growth, with an *account* of the number of trees, their age, nearly the quantity of fruit on each tree, and the manner of culture, to be produced on or before the first Tuesday in December, 1805.

147. The same premium is extended one year farther. *Certificates* to be produced on or before the first Tuesday in December, 1806.

148. Cloves. For importing into Great Britain or Ireland, in the year 1805, the greatest quantity of cloves, not less than twenty pounds weight, being of the growth of some of the islands in the West Indies subject to the British empire, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, and equal in goodness to the cloves brought from the East Indies; the gold medal, or fifty guineas. Samples, not less than two pounds weight, with *certificates* that the whole quantity is equal in goodness, together with satisfactory *certificates* signed by the governor, or commander in chief, of the place of growth, with an *account* of the number of trees growing on the spot, their age, and the manner of culture, to be produced to the Society on or before the first Tuesday in January, 1806.

149. Kali for Barilla. To the person who shall have cultivated, in the Bahama Islands, or any other part of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, in the year 1804, the greatest quantity of land, not less than two acres, with Spanish kali, fit for the purpose of making barilla; the gold medal, or thirty guineas.

150. For the next greatest quantity, not less than one acre; the silver medal, or fifteen guineas. *Certificates*, signed by the governor, or commander in chief, for the time being, of the quantity of land so cultivated, and of the state of the plants at the time of signing such *certificates*, to be delivered to the Society, with samples of the kali, on or before the second Tuesday in January, 1806.

151. The same premiums are extended one year farther. *Certificates* to be produced on or before the second Tuesday in January, 1807.

152. Destroying the Insect commonly called the Borer. To the person who shall discover to the Society an effectual method of destroying the insect commonly called the borer, which has of late years been so destructive to the sugar-canes in the West-India islands, the British settlements on the coast of Africa, and the several islands adjacent thereto; the gold medal, or fifty guineas. The discovery to be ascertained by satisfactory *certificates*, under the hand and seal of the governor or commander in chief for the time being, and of some other respectable persons, inhabitants of the islands, or other place, in which the remedy has been successfully applied; such *certificates* to be delivered to the Society on or before the first Tuesday in January, 1806.

153. Cultivation of Hemp in Upper and Lower Canada. To the person who shall sow with hemp, the greatest quantity of land in the province of Upper Canada, not less than six arpents (each four-fifths of a statute acre), in the year 1805, and shall at the proper season cause to be plucked the summer hemp (or male hemp bearing no seed) and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe; the gold medal, or one hundred dollars.

154. To the person who shall sow with hemp the next greatest quantity of land in the same province of Upper Canada, not less than five arpents, in the year 1805, in the manner above mentioned; the silver medal, or eighty dollars.

155. For the next greatest quantity of land, in the same province, and in a similar manner, not less than four arpents; sixty dollars.

156. For the next greatest quantity of land, in the same province, and in a similar manner, not less than three arpents; forty dollars.

157. For the next greatest quantity of land, in the same province, and in a similar manner, not less than one arpent; twenty dollars. *Certificates* of the number of arpents, the method of culture, of the plucking of the hemp, with a general *account* whether sown broad-cast or in drills, the expense, soil, cultivation, and produce, to be transmitted to the Society, certified under the hand and seal of the governor or lieutenant-governor, together with 28lb. of the hemp, and two quarts of the seed, on or before the last Tuesday in November, 1806.

158, 159, 160, 161, 162. The same premiums are extended one year farther. *Certificates*, &c. as before mentioned, to be transmitted to the Society on or before the last Tuesday in November, 1807.

163 to 173 Premiums exactly similar in all respects to those held out for the province of Upper Canada, are also offered for the province of Lower Canada, and are extended to the same period.

174. Importation of Hemp from Canada. To the master of that vessel, which shall bring to this country the greatest quantity of marketable hemp, not less than one hundred tons, in the year 1805, the produce of Upper or Lower Canada; the gold medal.

175. To the master of that vessel which shall bring the next quantity, not less than fifty tons; the silver medal. *Certificates* satisfactory to the Society to be produced by the master of the vessel on or before the first Tuesday in February, 1806, to testify that such hemp was grown and prepared in Canada.

176, 177. The same premiums are extended one year farther. *Certificates* to be produced on or before the first Tuesday in Feb. 1807.

178. Substitute for Hemp. To the person who, in the year 1806, shall discover and produce to the Society, a substitute for hemp, equally cheap, durable, and applicable to all the purposes for which hemp is now used; the gold medal, or fifty guineas. A quantity of the substitute, not less than one hundred weight, together with proper *certificates* from the governor or commander in chief, if raised in any of the British colonies, or from the Secretary of the Board of Trade, if raised in the East Indies, to prove that the same has been used with success, to be produced to the Society on or before the last Tuesday in February, 1807.

179 The same premium is extended one year farther.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH SETTLEMENTS IN THE EAST INDIES.

180. Bhaugulpore Cotton. To the person who shall import into the port of London, in the year 1805, the greatest quantity, not less than one ton, of the Bhaugulpore cotton, from which cloths are made in imitation of nankeen, without dyeing; the gold medal. A quantity of the cotton, not less than five pounds weight in the pod, and five pounds carded, to be produced to the Society, with proper *certificates*, signed by the Secretary to the Board of Trade of Bengal or Bombay, on or before the last Tuesday in February, 1806.

181. Annatto. To the person who, in the year 1805, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of annatto, not less than five hundred weight; the gold medal. A quantity of the annatto, not less than ten pounds weight, to be produced to the Society, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the annatto is the produce of such settlement, on or before the last Tuesday in February, 1806.

182. True Cochineal. To the person who, in the year 1805, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest

quantity of true cochineal, not less than five hundred weight; the gold medal. A quantity of the cochineal, not less than ten pounds weight, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the cochineal is the produce of such settlement, to be produced to the Society on or before the first Tuesday in February, 1806.

GENERAL CONDITIONS.

SOCIETY'S OFFICE, ADELPHI, JUNE 1st, 1805.

ORDERED,

That the several Candidates and Claimants, to whom the Society shall adjudge Premiums or Bounties, do attend at the Society's Office in the Adelphi, on the last Tuesday in May, 1806, at Twelve o' lock at Noon precisely, to receive the same; that Day being appointed by the Society for the Distribution of their Rewards: And before that time no Premium or Bounty will be delivered, excepting to those who are about to leave the Kingdom.

In Cases where the Society may think fit to admit excuses for not attending in person, Deputies may be substituted to receive the Rewards, provided such Deputies are either Members of the Society, or superior Officers thereof.

As the great object of the Society in rewarding individuals is to draw forth and give currency to those inventions and improvements, which are likely to benefit the public at large, candidates are requested to observe, that if the *means*, by which the respective objects are effected, do require an expense or trouble too great for *general purposes*, the Society will not considers itself as bound to give the offered *reward*; but, though it thus reserves the power of giving in all cases such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the candidates may be assured the Society will always judge liberally of their several claims.

All candidates are to take notice, that no claim for a premium will be attended to, unless the conditions of the advertisement are fully complied with.

All models of machines, which obtain premiums or bounties, shall be the property of the Society; and, where a premium or bounty is given for any machine, a perfect model thereof shall be given to the Society.

All the premiums of this Society are designed for Great Britain and Ireland, unless expressly mentioned to the contrary.

The claims shall be determined as soon as possible after the delivery of the specimens.

It is expected that all articles for claims or bounties be sent to the Society, carriage paid.

No person shall receive any premium, bounty, or encouragement, from the Society, for any matter for which he has obtained, or purposes to obtain, a patent.

A candidate for a premium, or a person applying for a bounty, being detected in any disingenuous method to impose on the Society, shall forfeit such bounty, and be deemed incapable of obtaining any for the future.

No member of this Society shall be a candidate for, or entitled to receive, any premium, bounty, or reward, whatsoever, except the honorary medal of the Society. The candidates are, in all cases, expected to furnish a particular account of the subject of their claims; and where certificates are required to be produced in claim of premiums, they should be expressed, as nearly as possible, in the words of the respective advertisements, and be signed by persons who have a positive knowledge of the facts stated.

Where premiums or bounties are obtained in consequence of specimens produced, the Society mean to retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No candidate shall be present at any meetings of the Society or committees, or admitted at the Society's rooms, after they have delivered in their claims, until such claims are adjudged, unless summoned by the Committee.

The Society, anxious to promote the Arts of their country, have adopted the resolution of forming a Collection of Prints, to be open for public inspection; and, having arranged those already in their possession, invite engravers to send etched or finished proofs of their plates: and hope amateurs, collectors, and publishers of works of art, will also contribute to the undertaking.

Prints of models, or maps, will also come within the above arrangement.

The Society farther invite the communications of scientific and practical men, upon all subjects connected with the views of the Society, although their experiments may have been conducted upon a smaller scale than the terms required by the premiums; as such communications may afford ground for more extensive application, and thus materially contribute to the advantage of the public.

The Library of the Society, which has already become very valuable, may yet receive con-

siderable additions and improvements from the presents of members, or other persons who may be inclined to place useful books or valuable manuscripts in a repository, at once permanent and conducive to the national benefit.

All communications to be made by letter, addressed to Mr. CHARLES TAYLOR, the Secretary, *at the Society of Arts, &c. Adelphi, London.*

The models required by the Society should be upon the scale of one inch to a foot. The Winchester bushel is the measure referred to for grain; and, as the acres of different districts vary in extent, it is necessary to observe, that the Society mean Statute Acres of five and a half yards to the rod or pole, when acres are mentioned in their list of premiums; and they request that all communications to them may be made agreeably thereto.

The Society desire that the Papers on different subjects sent to them may be full, clear, explicit, fit for publication, and rather in the form of Essays than of Letters; and where descriptive Drawings can be conveniently sent, with the Models and Machines laid before the Society, it is recommended to be done.

*** To persons inclined to leave a sum of money to this Society by will, the following form is offered for that purpose.

Item. I give and bequeath to A. B. and C. D. the sum of upon condition and to the intent that they, or one of them, do pay the same to the Collector, for the time being, of a Society in London, who now call themselves the Society for the Encouragement of Arts, Manufactures, and Commerce; which said sum of I will and desire may be paid out of my personal estate, and applied towards the carrying on the laudable designs of the Society.

By Order of the Society.

CHARLES TAYLOR, *Secretary.*

N B. The Society for the Encouragement of Arts, &c. considering that it would be beneficial to the Commerce of the United Kingdom, to bring the British Marbles into more general use, and that the most effectual method of accomplishing their object would be, for the present, *to make them more generally known in the capital, have come to the following resolutions* :---

Resolved,—That specimens of British Marbles be exposed in the Society's Rooms at the Adelphi, for the inspection of the public, under the following regulations:

1st, That all specimens be exact to a given size, *viz.* eight inches high, six inches broad, one inch thick, and polished on one face.

2d, That a book be kept, containing the number of each specimen, and describing the situation of the quarry, the name of the parish where situated, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future inquiries.

Resolved,—That as the exertions of the Society can only be beneficial to the public, inasmuch as their views are seconded by the public, the Society request, that all persons, proprietors of marble quarries, will favour them with a specimen of the marble, worked to the exact size above mentioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public.

PAPERS

IN

AGRICULTURE.

AGRICULTURE.

The SILVER MEDAL of the Society was this Session voted to the Right Hon. the Earl of BREADALBANE, for his PLANTATIONS of FIR TREES. The following ACCOUNT and CERTIFICATES were recived from him.

SIR,

WE do hereby certify, that the Right Honourable the Earl of Breadalbane, between the first day of October, 1801, and the first day of April, 1802, enclosed, partly by a dry stone wall, and partly (as the stones were scarce) with stone and turf, (the stones forming the foundation) and planted with Larch and Scotch Fir (ten of the former to one of the latter), a clump of high moor ground in Acharn,

Loch Tay side, altogether unfit for cultivation by the plough, containing forty-four Scotch acres or upwards, and which plants were principally one year transplanted from the seed-bed, and before planting the ground was carefully drained where necessary; and that the plants are now (December 1804) in a thriving state, and the plantation is properly fenced and secured. And it is our opinion that the proper mode for such ground is to plant Larch and Scotch Fir for shelter; afterwards to thin out the Larch and Scotch Fir, especially the latter, and plant Oaks and other Forest Trees: and all Forest Trees ought to be transplanted from the seed-bed, for at least one year, into good land, in a climate about half way between the Nursery and the ground in which they are to be planted latterly. This mode procures a strong root and a hardier plant; both which are essential to the success of the plantation.

The

The plantation above mentioned is in the parish and near the neighbourhood of Kenmore.

C. Mac Vean, Minister.
Robert Robertson, Land Surveyor, Ashmore.
Hugh Cameron, Tacksman, Acharn.

Dec. 31, 1804.

Charles Taylor, Esq.

The above account was also confirmed by Certificates from Patrick Carmichael, woodkeeper, Peter M'Laren, gardener and nurseryman, Archibald Cameron, planter and woodherd, and Hugh Cameron, ground-officer.

The GOLD MEDAL of the Society was this Session adjudged to THOMAS JOHNES, M.P. of Hafod, in Cardiganshire, for his PLANTATIONS of OAKS. The following ACCOUNTS and CERTIFICATES were received from him.

SIR,

SINCE the year 1798, there has been raised by Thomas Johnes, Esq. on Hafod estate, 922,000 Oaks from acorns, in order to secure a succession of Oak timber. The acorns were sown in the nursery in rows about a foot distant, so that they might more easily be kept clean from weeds. There is one great advantage in having them sown in rows, as a man can go with a spade and cut the perpendicular roots, after which they make fine lateral roots, and have no need to be transplanted for

two

two years. If they are too thick in the rows, we thin them so that they may grow stronger. The above trees are at this time in a very thriving condition.

JAMES TODD, Gardener.

Hafod, Dec. 12, 1802.

Mr. CHARLES TAYLOR.

SIR,

I NOW enclose you such an account as I hope will be satisfactory, and entitle me to the Honorary Premium of the Society, either for my Oaks, Larches, or Timber trees in general. In December, 1802, I wrote to inform you that my gardener had raised for me 922,000 Oaks, and which were then two years old in the nursery: of the above 58,600 were planted out last winter and last spring, agreeably to the Accounts and Certificates I have transmitted you. They are now in a thriving state. From the 24th June, 1801, to

June, 1802, 220,000 Larches were planted in the manner I have formerly mentioned, by making holes and covering the roots. All of which were planted on land not fit for the plough, and are well secured by good fences.

I am, Sir,

Your most obedient servant,

THOMAS JOHNES.

Hafod, Jan. 7, 1805.

To CHARLES TAYLOR, Esq.

Account of Trees planted for Thomas Johnes, Esq. of Hafod, in the county of Cardigan, in the year 1804.

On soil that could not be cultivated by the plough I have planted, this year, for him on Hafod Demesne the following trees, viz. 58,600 Oaks, 96,000 Beech, 20,400 Larch, and 400 Alders. As witness my hand, this 3d day of Nov. 1804.

DAVID RICHARDS, Gardener,

A Cer-

A Certificate from the Rev. Lewis Evans, Minister of Eglwys Newydd, dated the 5th of November, 1804, confirmed the above; adding that the same are well fenced by a stone wall, and in a thriving condition.

The

The GOLD MEDAL of the Society was this Session adjudged to JOHN CHRISTIAN CURWEN, Esq. M. P. of Workington Hall, in Cumberland, for the culture of BEANS and WHEAT. The following ACCOUNTS and CERTIFICATES were received from him.

SIR,

THE offer of a Premium by the Society of Arts, &c. for the culture of Beans preparatory to a Wheat Crop, being, as I conceive, for the purpose of demonstrating the superiority of green crops over dead fallows; I shall be considered, I flatter myself, as acting consonant to the views of the Society, in offering a detailed account of my proceedings, more especially as it will appear incontestably, that, if any advantage has resulted from a trial under such very unfavourable circumstances, the most sanguine expectations may fairly be

be entertained of the general utility of the system. The plot of ground on which the experiment has been made, contains forty-two acres, the soil is a stiff clay, so flat as to afford very little fall for the water. The least continuance of rain renders it unworkable, though it has been drained as far as was practicable. It was broken up in the spring of 1800, and in that and the following year was under oats, both crops very heavy; in 1802 it was set with potatoes; in June, they were run through with the potatoe harrow, and made quite flat before they could be stitched up again. The wet set in and continued so long, that the crop was in a great measure ruined, and the weeds got to such a head that it was not possible to get the ground cleaned. It was sown with wheat in November, 1802, by great exertions, but it was in so very unfit a situation that the greatest part of the seed perished; above half was re-sown with

with oats, in April, 1803, being as soon as it could be got upon. Immediately after the crop was got off (early in October, 1803) the stubble was turned up: in many parts the grass was so thick and strong, as to make it difficult for the plough to get through it. The winter proved so mild that it had done it little good. In many parts the harrows could not break it, and the grass was obliged to be cut and carried off by the hand. The advantage of a second ploughing would have been great, but by attempting it I might have lost the season for getting in the beans; I was restrained therefore from attempting it.—Forty acres were drilled before the end of February, 1804, with a drill of the construction of Mr. Mac Dougals, six feet wide, sowing the rows at twenty-six inches apart. The weeds and roughness of the land would not admit of the drills being kept exactly straight, which occasioned additional trouble in cleaning, as also some

loss

loss in the crop. Forty-nine and a half Winchester bushels were sown.—I have been thus particular, to convey a just idea of the uncommon foulness of the ground, and the difficulty I had to contend with in consequence of it. The beans came up extremely well, notwithstanding the extreme severity of the spring. No step was taken in cleaning till the 10th of May, 1804; this neglect proceeded from the multiplicity of other business, and my over-man being unacquainted with the drill husbandry, and the advantages of beginning to destroy the weeds as early as possible; from the 10th of May till the middle of July, which was as long as it was practicable to continue, the ploughs and harrows were constantly employed, and it was twice hand-weeded during the time. The cutting of the beans commenced the 20th of August: had the weather permitted, it might have been a week earlier. The method followed, which I had

had practised with success the year before, was to cut and spread the beans thinly, and to leave them exposed to the sun two days previous to binding. By the 26th, the whole was cut, and the field cleaned by the 29th.—I gained by these means above a month, which on wet land is of infinite advantage; I had great mortification in finding, after cutting the beans, the stitches extremely foul, notwithstanding all the pains I had taken. Any thing so dirty as this ground could seldom be met with; the season was very favourable, and I began to clean it immediately; I gave it two ploughings, and in some parts three, breaking it with harrows, raking and hand-picking it. I had, by the 20th of September, 1804, the satisfaction of seeing it in a better situation than any fallow in the neighbourhood, and began to plough for wheat; on the 29th, it was completely drilled, rolled, and water-furrowed. My friend Mr. Green,

a member of the Society, who visited the field, was so struck with the busy scene, that he requested to have the people and the horses counted. There were fifty-nine men and women, and thirty-one horses; fourteen single, and one double cart, four ploughs, four harrows, drill, roller, and water-furrow plough, a horse each. It took sixty-two and a half Winchester bushels of seed; I had sixty carts of compost per acre, composed of dung, ashes, and street-rakings, that had been collected during the summer, and laid in the most convenient situations to facilitate the work. The filling, leading and spreading of 2500 carts of compost was a work of some magnitude; the month of October proved so wet that, had it been delayed a week later, I should not have been able to have accomplished it. The labour it cost me after the beans were cut was very little inferior to a regular fallow; notwithstanding, the result, with this

this increased expense, will be found to be in favour of the experiment. The tick bean, which was sown on thirty-nine acres out of the forty, produced more abundantly than the other bean, which was sent me by Messrs. North and Bridge, and, being a later bean, is not adapted to this climate. The crop was good; one stalk of the tick bean had 70 pods, and these produced 353 beans; the weight, four stone thirteen pounds the Winchester bushel; the other bean, four stone four pounds. The crop produced 2,010 stooks; from a few stooks which were left out of the stacks for the purpose of affording specimens for the Society, I have reason to suppose they will yield ten quarts per stook, or 628 Winchester bushels. I estimate by the London seed, which is least productive. The selling price is 5s. per Winchester, which would make the amount £167. 9*s.* 4*d.* The stooks had been exposed to the inspection of various

various persons who wished to see in what state the beans were, so that I suppose some loss in the quantity. The following is taken from the over-man's day-book, and I believe the greatest attention was paid to have the expense correct.

	£.	s.	d.	£.	s.	d.
49½ bushels of seed, at 5*s.* 4*d.* ..	13	3	11			
40 acres ploughing and harrowrowing, at 12*s.*	24	0	0			
8 days work with drill, at 7*s.* 6*d.*	3	0	0			
4carts two days leading weeds, at 5*s.*	2	0	0			
24 women cutting weeds, at 9*d.* ..	0	18	0			
				43	1	11
141 days ploughing and harrowing, at 5*s.*	35	5	0			
435 days work of women weeding, at 9*d.*	16	6	3			
45 days work of men, at 2*s.*	4	10	0			
				56	1	3
168 days work of women cutting, at 1*s.* 3*d.*	10	10	0			
30 men's days work, at 2*s.*	3	0	0			
66 women's days work, binding, at 1*s.* 3*d.*	4	2	6			
22 men's ditto, making bands, &c. at 2*s.*	2	4	0			
				19	16	6

	£.	s.	d.	£.	s.	d.
27 men and horses leading the beans off the ground, at 5s.	6	15	0			
18 women's days work, at 9d.	1	2	6			
Stacking and leading the beans ..	7	15	0			
				15	2	6
				£134	12	2

Further expenses after the crop of beans was cut.

Twice ploughing and harrowing 40 acres, at 12s.	48	0	0			
Ditto 6 acres a third time, at 12s.	3	12	0			
2 carts 6 days, leading off weeds and stones, at 5s.	3	0	0			
48 women picking, at 9d.	1	16	0			
10 men ditto, at 2s.	1	0	0			
				£57	8	0

Expense of sowing, cleaning, and reaping the beans,	£134	12	2	Value of crop 628 bushels, at 5s. 4d.	£167	9	4
Had the wheat been then sown, the balance in favour of the crop would have been					75	12	0
					£243	1	4

By further expenses as above	57	8	0
	192	0	2
Balance in favour of the green crop, giving credit for the expense of a fallow,	51	1	2
	£243	1	4

The

The appearance of the wheat is most promising. It is my intention to take another crop of beans, which will most completely clean the ground, then give a second dressing of from 20 to 30 cart-loads of compost, and sow it with wheat and seeds in the spring.

Should farther information be requisite, I shall be happy to give it.

I am, Sir,

Your obedient servant,

I. C. CURWEN.

Workington Hall, March 20, 1804.

CHARLES TAYLOR, Esq.

DEAR SIR,

AN opportunity offering by which I can send you a sample of my Beans for the inspection of the Society, I think it more advisable than waiting till the meeting of Parliament; should it occur to you that any further information is requisite, I will be much obliged to you to acquaint me with it. I think I may, without arrogating too much, say, the manner in which the crop was worked and got into the ground, and its present appearance, is not inferior to any thing which has been done in any part of the kingdom. The accounts of expense were kept with great care and attention. I shall be highly gratified in being successful in my application for the medal. Should any information be wished by the Committee, my friend, Mr. Greene, of Bedford-

ford-square, would willingly attend, as he expressed great pleasure at what he saw whilst we were putting in the crop. It has drawn the attention of the farmers in the neighbourhood; and when I come over it again, I hope they will be sensible of the advantages resulting from the plan. I am this winter trying an experiment in feeding milch cows, and selling the milk to the poor, who have hitherto been extremely ill supplied. I conceive, by feeding the cows with green food and oil-cake, I can furnish the milk as cheap, and with as much profit as in summer. I give each cow four stone of green food, at 1½d. per stone, four pounds of oil-cake at 1d. straw 2d. making the total one shilling. New milk is 2d. per quart—any thing above six quarts is profit. I have thirty cows, mostly heifers; these afford less milk; but I can dispose of them without loss in March or April, having no keeping

in summer, or design to interfere with other farmers. I sell near two hundred quarts per day, besides my own consumption, farm-house, &c. &c. The cattle are in admirable order. I keep them in open sheds, and turn them out several hours every seasonable day. The crops here were in general good. I had an acre and three rood of carrots, which produced five thousand stone; the ground was by no means good; but they were sown upon ridges, gathered as high as possible, with a double mould-board plough, and kept well worked during the summer. My success will induce many trials. I give five pounds each day to my horses, instead of oats, which saves me sixty Winchester bushels per week, or £20. The Bishop of Llandaff is very busily employed planting a hundred acres, mostly with Larch; not to interfere with

him,

him, I wait till next year, when I shall plant between one and two hundred acres, lately purchased.

With great respect;
I am, dear Sir,
Your obedient humble servant,
J. C. CURWEN.

Workington-Hall, Nov. 20, 1804.

CHARLES TAYLOR, Esq.

Certificates from Mr. Archibald Dickson, of Hassendeanburn, near Howich; Messrs. William Falla and Co. of Gateshead; Matthew Foster, John Hetherington, John Atkinson, and Humphry Tyson, of Workington; and Isaac Kendal; confirmed the Accounts received from Mr. Curwen

DEAR SIR,

I WISH to add to the communication I had the pleasure of making to you, respecting the culture of Beans, that I have thrashed out two stacks, and found the straw most admirable fodder. Horses are extremely fond of it; and I have, in no instance, found it to disagree with them, which I have understood to be frequently the case when the bean stands till it is quite withered. This advantage in favour of cutting the bean green had not occurred to me, and will add much to the value of the crop, and supply the place of oat straw, which is nearly of equal value with hay. I have not used any hay this season, but given bean and other straw with potatoes and corn, and find the horses in high condition. The experience of every year convinces me of the great saving in my plan of feeding, as well as its being

being the best food that horses can have for keeping them in condition and health. Lucerne and an equal quantity of corn will not keep the horses in the same condition as with potatoes. It is supposed this feed is not adapted to quick work: I can only say, I seldom travel less than eight miles per hour with my carriage-horses so fed, and I drove them thirty-five miles a few days ago, in four hours and three quarters, and this without any injury or distress to them.

With respect, I am,
Dear Sir,
Your obedient humble servant,
J. C. CURWEN.

Workington-Hall, Jan. 25, 1805.

CHARLES TAYLOR, Esq.

The

The GOLD MEDAL of the Society, or THIRTY GUINEAS, at his option, was this Session voted to Mr. WILLIAM TAYLOR, of Beamish, in the county of Durham, for IMPROVING LAND LYING WASTE.

Mr. TAYLOR preferred the Honorary Reward.

The following ACCOUNTS and CERTIFICATES were received from him, accompanied by a PLAN, which may be seen by application at the Society's House.

SIR,

AFTER requesting that you will accept my thanks for your very obliging letter, I beg to trouble you with an account of some land drained in a capital manner by my steward, Mr. Taylor, of Beamish, near Chester-le-Street, in the county of Durham; which he

he wishes may be laid before the Society, in the hope that his labours may receive some premium.

I knew perfectly well this land before he bought it; and as my allotment adjoins to it, I have frequent opportunities of viewing it, and I do not think Mr. Martindale, who has valued it, is too high in his valuation.

Mr. Martindale is a man of character, and frequently employed as a commissioner in dividing commons, &c. and ought to know well the value of land.

I am, Sir,

Your very humble servant.

JOHN EDEN.

Pall-Mall, May 29, 1804.

To Mr. CHARLES TAYLOR.

SIR,

SIR,

I PURCHASED on the 27th day of May 1799, at a sale, 308 acres of common or heath land, over-run with whins, ferns, and obnoxious heath-grasses, springs, bogs, and spungy lands, for the sum of £2665, without any buildings; and being no farmer before that time, I have it in my power to state the expense that has been incurred in draining this barren or waste land, and the utility it is to this country, to use every exertion to bring into cultivation the many thousand acres which at present lie waste, and, where it cannot be improved, to convert it into plantations. The difficulties with which I had to contend at the outset were innumerable, and attended with great expense and inconvenience, having neither buildings nor food for my horses to cultivate the land,

and

and hay was at that time £8. per ton—160 stone at 14lb. to the stone, and oats 6*s*. 3*d*. per bushel. In the summer months, my ten horses grazed on the common; but in the winter, I was obliged to seek shelter in the new buildings belonging to Sir John Eden, which were erected for his adjoining allotment; this cost me a considerable sum of money before I could reap any provender for my horses, (which was a space of 15 months). Having purchased so late as the 27th of May, I could get no produce that year. The draining, paring, burning, and making new hedges, was my first and necessary object to pursue. The drains have been made of various sorts, as described in my plan, some deep drains with flag-bottoms and side-walls, from 18 to 20 inches in height, and well covered, and a quantity of land-stones for the water to ooze through into the drains. The greatest difficulty in draining was, where I met with running sands.

sands. Stones were of no use, as they sunk (from the colliery borings made in the land, it appeared, the depth of sand and water was 28 yards); consequently I had recourse to prop-ends, from 9 to 18 inches long (refuse wood left underground in collieries), and strong whin shanks, and so made drains of a kind of trellis, or wicker-work; and these being light, may be called a kind of swimming drain, being well covered with a turf sod on straw, and have answered for upwards of three years extremely well, and no appearance of any failure, as I have had occasion to extend new drains into them, and found them entire. The land was in that state, I could grow no hay for my work horses, and it could not be expected for three years: it must be supposed, the consumption of corn was great; but in this I experienced a considerable alleviation. At that juncture, Sir John Eden having extensive allotments which I have had to manage and

bring

bring into cultivation, and on which was growing a considerable quantity of corn, he purchased a straw-chopper, that the horses corn might be mixed with straw (the number of horses employed in his colliery was considerable, and draught horses 18): this answered very well; but the manual labour to be done was severe, and took up much time; and, having a thrashing machine, I got the straw-chopper fixed to go by the same power, which answered the purpose completely; for two women can manage the feeding for 9*d.* per day each; and when the thrashing machine is not going, a boy to drive a galloway, and these two women, can perform more work than six men at 2*s.* 3*d.* each. The advantages arising from the use of this machine were so obvious, that I immediately procured one: but a few days experience convinced me, that a great improvement might yet be made, that if the machine would chop the oat

sheaves

sheaves, the thrashing would be saved, and the corn would be cut. Having the knives in good condition, the straw and oats were chopped and so mixed, that they could not be swallowed unless well chewed. By giving my horses no corn by itself, as it is often wasted by their greediness of swallowing it, particularly old horses, I found upon calculation so considerable a saving by giving them their food in this way, rather than the general allowance of corn alone given to work horses, that from the commencement of using the straw-chopper, my ten horses have not eat ten stone of hay each; I give them straw in the fold-yard, and their chopped straw and corn in the stable. I found it of the utmost utility to Sir John Eden and myself, to give to each man a fair proportion of this provender in bags, when they go to their day-work, allowing no hay; for it is well known to every experienced farmer, the loss he

suffers

suffers by giving his men hay when they go from home; as, frequently, one-fourth part is left in the corner of the fields, or by the side of the highways. By the manner of feeding horses described, I can confidently say, one-fourth part of the value of the food is saved, and the spirits and condition of the animal superior to the common mode of feeding; and I have the pleasure to add, my servants are often complimented on the fine condition and sleek skins of the horses. I have with this report sent a small sample of the performance of the straw-chopper, in cutting oat sheaves.

Having no pasturage for my horses, the second year I summer-fallowed 20 acres of land of an equal soil; and in the beginning of August had the same sown with grass-seeds, and divided into four parts, with a different proportion of seeds, as a future guidance, to inform myself which answered the best; and herewith have sent you the result of the

trial and expense, marked B in the plan. Also, have presented an account of the weight and value of hay, the produce of five acres of drained land, as marked D in the plan; which, with the remainder of the field, was well summer-fallowed and limed, and sown the latter end of July, 1802, with rye-grass and white and red clover, the whole produce of which was 35 tons.

The whole of the estate is now got into cultivation, except some patches of land that cannot be cultivated, and inaccessible banks. I have converted the best parts into nursery beds, which contain three acres of small pieces, in different parts; and have about 17 acres of banks yet to plant, as my seedling trees advance.

Expense on 20 Acres of Land laid to Grass.

B	£.	s.	d.
Stubbing and burning whins, as per bargain, ...	20	0	0
Paring, as per bargain, ...	20	0	0

Burning

	£.	s.	d.	£.	s.	d.
Burning sods and spreading ashes,	7	10	0			
Ploughing at 12s. per acre, (first time)	12	0	0			
Ploughing at 8s. per acre, (second time)	8	0	0			
Harrowing twice, at 5s. per acre,	5	0	0			
Rape seed,	2	4	0			
Draining, as per account,	31	18	8			
	106	12	8			
Received for rape, (a bad crop)	51	12	0			
				55	0	8

Fallowing the same in the Autumn 1800, *and Summer* 1801.

Thrice ploughing, at 8s. per acre,	24	0	0			
Harrowing four times at 2s. 6d. per acre,	10	0	0			
Twice weeding and gathering, as per bill,	22	18	0			
Lime, sixty fothers, slaking and spreading at 12s. 6d. per fother,	37	10	0			
Grass seeds, as per account,	22	18	8			
Harrowing and rolling, at 7s. 6d. per acre,	7	10	0			
				124	16	8
Nearly £9. per acre.				£179	17	4

1801, August 1st—Sown with grass seeds, viz.

One quarter part, old land hay seed 10 bushels, white clover 7 pounds, per acre. } did not answer.

One quarter part rye-grass, 1 bushel per acre, white clover 7 pounds per ditto.	Second year answered well for pasture.
One quarter part, ½ bushel rye-grass 3lbs. of red clover, 7lbs. white clover.	Answered the first and second year.
One quarter part, hay seeds, white and red clover, and hop clover.	Not so well.

From the former experiment it appears, that one bushel of rye-grass was over much for an acre, as it choaked or destroyed a part of the white clover;—this clover, which is apparently a native of heath-lands (as may be observed in some parts of extensive commons that have never been in cultivation), thrives well in most situations, and improves in quality the second year, as I have observed: I can say for no longer, as my land is not in a state to be continued long at grass, and I am pursuing the following state of cultivation. First, to fallow, clean the land well, and lay not less than 3 or 4 fothers of clod lime, equal to 24 or 32 bolls per acre, with a

fair

fair proportion of manure, and sow the same in the early part of June, with turnips, to be eaten in the winter months with sheep, and sown in the spring with such kind of grain as I think the land best adapted for; and also, sowing six pounds of white, and four pounds of red clover, with half a bushel of fine rye-grass. The first year, the seeds to be mown, the second year pasture, and the third year oats, and the following year to be fallowed, and so in rotation; and this scheme of husbandry I shall pursue, until I am perfectly satisfied the heath roots are sufficiently destroyed.

Drain D. described in the plan as being a pool of water, was sown with grass-seeds when fallow, containing five acres, in August, 1802; and mown the 14th day of June, 1803. Produced 2 tons 14 cwt. of fine hay per acre, reckoning 160 stone per ton, which is equal to 13 tons 10 cwt. at £5 per ton,

amounring to £67. 10s. and the fog, or second grass, was worth 25 shillings per acre, for eatage.

This shows the utility of draining; and from the long experience I have had in the management of Sir John Eden's extensive draining, I have always calculated at 30 per cent. profit; and in some situations, I have proved draining to have paid the expense and rent the first year's crop, and the following year double the rent: this was to me a great inducement for engaging with so large a tract of waste and barren land to improve.

Cash Dr. to William Taylor, as expended on Pelton Grainge Estate.

	£.	s.	d.
Casting drains as per bargain 3 feet deep—breadth at top 3 feet—at bottom, 1½ feet; making the same complete as per plan, from June 21st 1799, to December, 1801; 2½ years, being 19,257 yards, or 10 miles, 1657 yards, ...	567	1	0½
In 1802 and 1803—4805 yards—2 miles 1285 yards.—Total, 24,062 yards, or 13 miles 1182 yards, ...	140	2	11

A A. Making

	£.	s.	d
A A. Making drains as per day's work, which could not be done by bargain, from 6 to 9 feet deep, in a black peat moss and running sand, and bringing up a drain B by the side of the high road, from 9 to 12 feet deep, walling and flagging the bottom.—Length, 208 yards, to prevent a runner of water overflowing several acres of flat land, and also to prevent the water from getting into a number of drains to the East. (See plan C C)	47	12	9
C C. Making drains as per day's work, in a black peat moss and running water, with sand 9 feet deep; also, containing large bogs of water with fluent springs. When the water was drained off, the ground lowered 6 feet	35	8	0
D. Making a large drain, 978 yards long, and 7 feet deep throughout; walling and flagging the same, to clear a parcel of ground, upwards of 5 acres, and a large feeder of water; and also, making an open drain to take off the day water, which nearly overflowed this quantity of land, in snowy and wet weather, and rendered it entirely useless, ...	37	8	1

	£.	s.	d.
E. Bringing up levels out of Black-bourn, and draining a bog on a deep peat moss a considerable depth, to bring other drains through the same	23	0	0
F. Taking up a level in a place called Hereford Stells; to drain a lough, or deep pool of water, lying in the middle of a large piece of flat land. This drain was the whole length from 9 to 12 feet deep, 8 feet broad at top, and 4 at bottom, in a strong running sand, walling and flagging the same; here we unfortunately, from contending with water and sand, lost level, and this work is now doing over again, ...	29	0	0
In 1802 and 1803 draining the above; bringing up levels 3 feet deeper, and making additional drains. First length 105 yards, from 11 to 14 feet deep, and 3327 yards; 7, 8 and 9 feet deep; flagging, walling and making the same complete	34	5	9
H H. Cutting Black-bourn by the side of the high road; making a wall 6 feet high, and penning the bottom, to prevent the water overflowing a quantity of land, where it ran in a zig-zag form, ...	16	0	0

Black-bourn,

	£.	s.	d.
Black-bourn, which runs through the middle of the estate, I was under the necessity of cutting straight, it running in a zig-zag form; also in other places; and brought up levels to make drains into this little rivulet, which in wet weather overflowed several acres of land; and would have over-run a large quantity of deep drains C C. The same is by measurement, in length, 1188 yards, at 5d. per yard; being 4 feet deep, 4 feet broad at top, and 3 feet at bottom; this is upon a vague calculation, as no account was kept, but was in the general account of expenditure, ...	24	15	0
G G. Cutting Twizell-bourn straight, a rapid running water, and cutting through a hill where the drain was 50 feet deep; piling, and fendering, which gained a quantity of haugh-land, and covering the old bourn-way with soil. I have not the particular days works, as they are in the general account of expenditure, but am certain they would exceed	55	0	0

Stubbing

	A.	R.	P.	£.	s.	d.
Stubbing whins, and burning per account, ...	180	2	3	162	7	8
Paring, burning and spreading ashes per account, ...	190	0	0	262	0	0
Making new hedges, planting 79,258 quick-sets—posts, rails, and nails—11,394 yards, or 6 miles, in 1½ years, cost, as per account of particulars, 4s. 1d. per rood, ...				335	3	3
36 new gates, loops, crooks, &c. and hanging,				41	8	0
Lime 183 fothers, laying on and spreading, at 12s. 6d. in 1800 and 1801, ...				114	16	0
Lime 215 fothers, laying on and spreading, at 12s. 6d. in 1802 and 1803, ...				134	7	6
Seedling forest trees, and 34 bushels of acorns,				25	14	6
Expended in buildings, cultivation of lands, horses and implements of husbandry, &c. over and above the sum received for the produce of the farm, viz. £1996. 6s. 6d.				1714	7	11
				£3799	18	4½

Annual Expense from the Commencement, viz.

From the 27th May, 1799, to the	£.	s.	d.
31st January, 1801, ...	2168	4	6
Received in the above time, ...	151	18	0
One year and seven months	1916	6	6

Expenses

	£.	s.	d.	£.	s.	d.
Expenses brought forward				1916	6	6
Expended from the above time to 22d of November, 1801, viz.	2246	9	5			
Deduct on account of purchase money, ...	1000	0	0			
	1246	9	5			
Received in the above time,	384	4	6			
				862	4	11
Expended from the above time to 22d November, 1802, ...	3059	6	6½			
Deduct in full for purchase-money	1665	0	0			
	1394	6	6½			
Received in the above time,	605	0	9			
				789	5	9½
Expended from the above time, to 22d of November, 1803, ...	1087	4	5			
Received in the above time,	855	3	3			
				232	1	2
Expended over and above what has been received, ...				3799	18	4½
Purchase as above, ...				2665	0	0
				£6464	18	4½

TOTAL DRAINING PER PLAN.

	Miles.	Yards.
1st as per account of plan	13	1182
AA	0	208
CC	0	886

	Miles.	Yards.
D	0	976
E	0	467
F	0	105
F ..... 2d time making complete	1	1567
HH	0	108
Black-bourn open drain, as per plan	0	1188
GG ..... ditto	0	1260
Total	18	907

Valuation of Stock at Martinmas, 1803.

	£.	s.	d.
1420 thraves of oats, at 7s.	497	0	0
518 ditto of maslin, at 10s.	259	0	0
50 ditto of barley, at 5s.	12	10	0
Turnips	140	0	0
26 acres of maslin, sown at £3	78	0	0
30 tons of hay, at £5	150	0	0
10 horses	168	0	0
Carts, ploughs and harrows	87	0	0
1400 yards of hurdles, at 6d.	35	0	0
2 cows	28	0	0
Cattle in hand	359	15	5
Swine	16	0	0
Valuation of nursery trees, per account	123	11	0½
Thrashing machine	60	0	0
Straw chopper	12	0	0
2 winnowing machines	15	0	0
Old oats sold	17	14	0
	£2058	10	5½

Valuation

Valuation of Pelton Grange Estate,

In the Parish of Chester-le-Street, and County of Durham, belonging to WILLIAM TAYLOR, Esq.

Quantity	Tenure	Average value per acre	Annual value	Years purchase	Total value
Acres		£. s. d.	£. s. d.		£. s. d.
151	Freehold	1 4 0	181 4 0	27	4892 8 0
75	Copyhold	1 7 6	103 2 6	24	2475 0 0
59	Leasehold	1 7 6	81 2 6	18	1460 5 0
22	Do. to plant	0 10 0	11 0 0	18	198 0 0
307			376 9 0		9025 13 0

The above is a fair Valuation of the Estate, according to the best of my skill and judgment.

JOHN FRYER.

Newcastle, 24th March, 1804.

TOTAL EXPENSE.

	£.	s.	d.
Purchase	2665	0	0
Title obtaining	176	9	3
Buildings (no farm house)	935	0	0
Draining, hedging, planting quicks, nurseries, per account	1960	10	5½
Agency for self 2½ years (afterwards got a person to manage)	125	0	0
Interest due on the purchase, and on money expended from the commencement to Nov. 22d, 1803	750	0	0
Incidentals, horses, taxes, and cesses	477	18	7½
	7089	18	4
Valuation of stock at Martinmas, 1803	2058	10	5½
	£5031	7	10½

Valuation of the estate made by Mr. John Fryer, as per account annexed	9023	13	0
Expended as above	5031	7	10½
Gain	£3992	5	1½

Valuation

	£.	s.	d.	£.	s.	d.
Valuation of stock at Martinmas, 1803,				2058	10	5½
The former year's valuation				1353	15	6
				£704	14	11½
This year's payments,	1087	4	5			
Deduct incidental charges for obtaining title, included in the above sum,	176	9	3			
	910	15	2			
This years receipts	855	3	3			
				55	1	1
Gain				£649	3	0½

Valuation of Forest Trees in the Nursery, November 25, 1803.

			£.	s.	d.
163516	Oak trees,	at 10*s.* per thousand,	81	15	2
12574	Quicks,	at 7*s.* 6*d.* ditto,	4	13	8½
16740	Beech trees,	at 11*s.* ditto,	9	4	1
3540	Silver firs,	at 23*s.* ditto,	4	1	6
1436	Larch firs,	at 30*s.* ditto,	2	3	0
560	Alders,	at 20*s.* ditto,	0	11	0
714	Scotch firs,	at 10*s.* ditto,	0	7	0
4000	Larch,	at 15*s.* ditto,	3	0	0
4400	Hazels,	at 30*s.* ditto,	6	12	0
1200	Hollies,	at 5*s.* ditto,	0	6	0
566	Ashes,	at 10*s.* ditto,	0	5	6
576	Sycamores,	at 10*s.* ditto,	0	5	7
			113	4	6½

Planted

	£.	s.	d.	£.	s.	d.
Brought forward				113	4	6½

Planted in 1802 *&* 1803.

2300 Larches, at £2 per thousand, ...	4	2	0			
1500 Oaks, at £3 ditto, ...	4	10	0			
500 Scotch firs, at 25*s.* ditto,	0	12	6			
300 Beeches, at £2 ditto, ..	0	12	0			
				10	6	6
Received of the Honourable Lord Eldon, (by Sir John Eden) for oaks to plant on his Eldon estate, ...				12	0	0
				£135	11	0½

A large quantity of forest seeds sown in 1803, which cannot be ascertained.

Certificates received from Mr. Matthew Forster, of Broomyholme, and from Wm. Nesfield, Esq, one of his Majesty's Justices of the Peace for the county of Durham, confirmed the above statements, and that the ground now produces rich and abundant crops.

The

The SILVER MEDAL of the Society was this Session voted to Captain JOHN MILLER, of New Park, Axminster, Devonshire, for his new-invented SHEEP-SHEARS, ENGRAVINGS of which are annexed, and a Pair of the Shears reserved in the Society's Repository.

The following ACCOUNTS were received from him.

SIR,

BEING present at the shearing of some sheep, in July, I observed that they were frequently cut, and sometimes pieces of their skin and flesh were cut entirely off, which gives not only much pain to the animal; but if cut severely, may be attended with loss to the owner; I have therefore contrived

a plate of iron to screw to one of the blades of the shears, the edge of which plate projects beyond the edge of the shear, so as just to be visible when the shears are open and held in the position for shearing, that is, the plate downwards, laid on the sheep; this plate must be unscrewed and taken off when the shears require sharpening. I have seen a sheep sheared with the shears I send to you; and the farmer who used them said they made as good work as those in general use; and it appeared to every one present that it was hardly possible to cut the sheep in using them. The experiment was made at a farm called New Park, near Axminster, belonging to Mr. John Harvey Pierce, who esteemed it as a useful invention for the purpose intended. I therefore take the present opportunity of communicating this to the Society, trusting that through their patronage of useful contrivances, it will sooner be introduced

to

to the public; and if it should prove of utility, I shall feel much gratified.

I am, with great respect, Sir,

Your humble servant,

JOHN MILLER,

Post Captain, Royal Navy.

New Park, Axminster, Devon,
August 13th, 1803.

CHARLES TAYLOR, Esq.
Secretary to the Society of Arts, &c.

REFERENCE *to the* ENGRAVING *of Capt.* JOHN MILLER's SHEEP SHEARS.—*Plate I.*

SIR,

ENCLOSED I send you drawings and a further description of the Shears for which the Society has done me the

honour of presenting me with the Silver Medal.

Fig. 1, in the annexed drawing, represents a pair of common sheep shears, with a thin plate of iron screwed with three screws to the under-part of the blade A, which plate may be about the twentieth part of an inch thick, and exactly of the same size as the blade of the shear to which it is screwed, so that the edge of the plate and the edge of the blade shall be in a line, not allowing either to project beyond the edge of the other. This plate must be unscrewed and taken off when the shears require to be sharpened; and it may be necessary to remark, that as the blade of the shear wears by frequent sharpening, the edge of this plate must also be reduced so as always to be kept in a line with the edge of the blade, and not to be left to project beyond it; for that would give the wool a

sloping

Captain T. Miller's Sheep Shears.

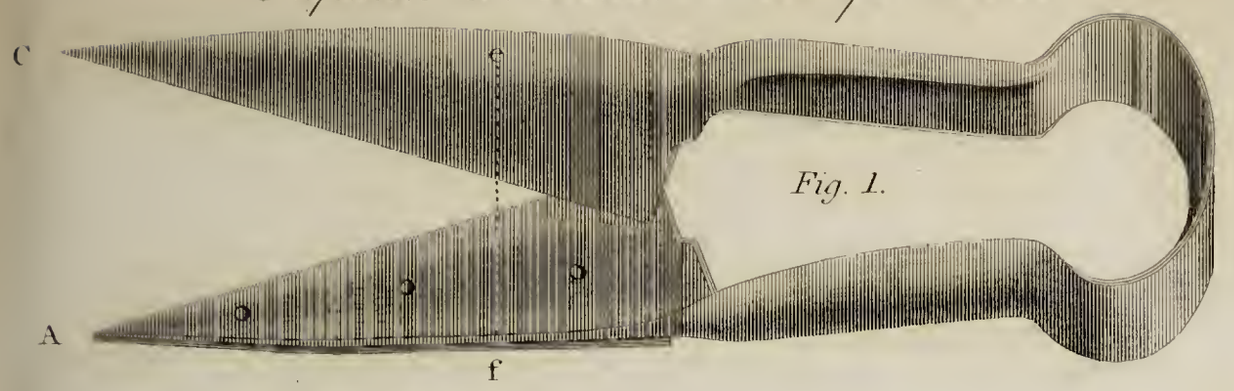


Fig. 1.

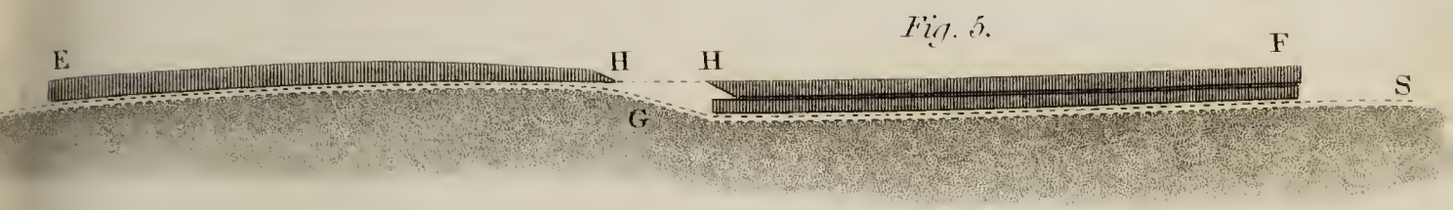


Fig. 5.

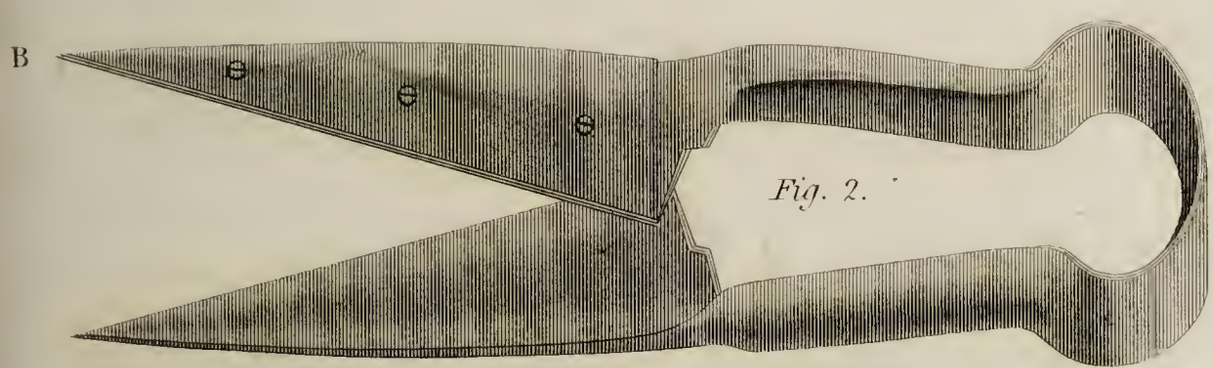


Fig. 2.

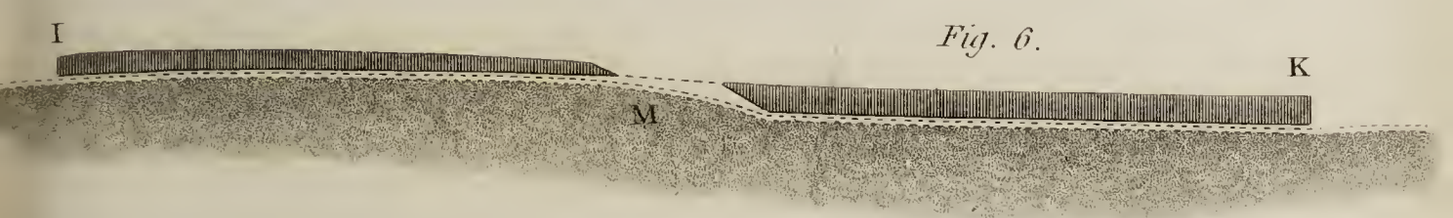


Fig. 6.

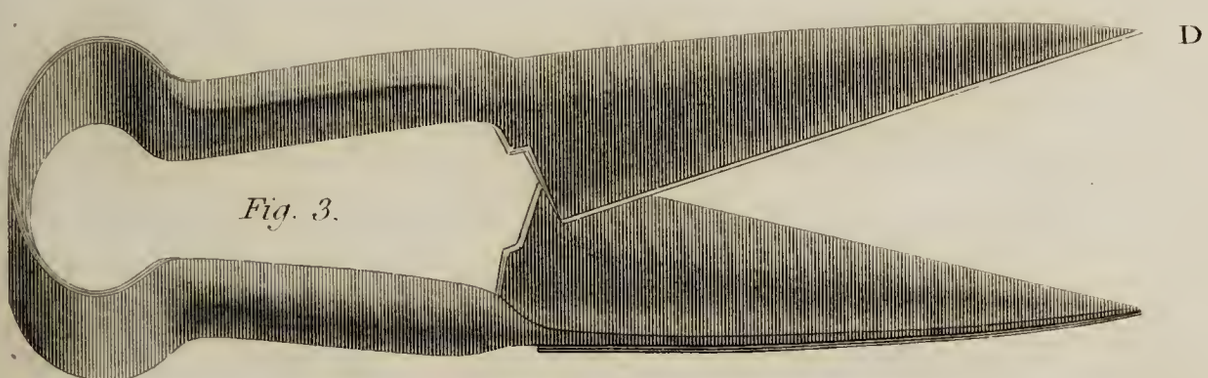


Fig. 3.

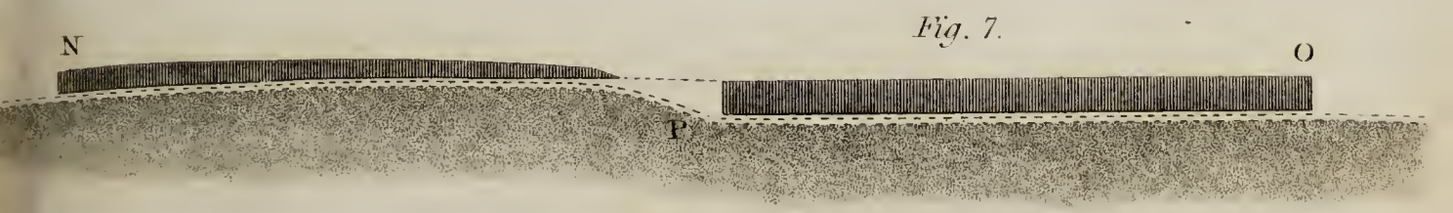
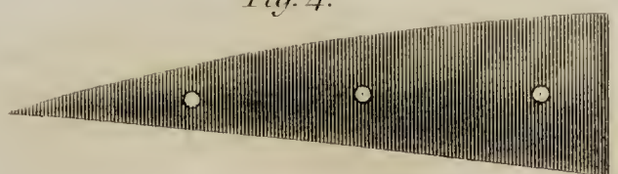


Fig. 7.

Fig. 4.



S. Porter sculp.

sloping direction, which would render it more difficult to cut. The shears represented in this Figure, are in the proper position for shearing with the right hand. The blade C, to be inserted into the wool.

Fig. 2 shews the same shears reversed; the plate B uppermost, to shew the manner of screwing it to the blade. Counter-sunk screws are recommended; and they must not go through, so far as to take the edge of the other blade in closing the shears.

Fig. 3. A pair of shears requisite for a left-handed shearer; the blade D, to be inserted into the wool; for it is evident, if the shears *Fig.* 1. were used with the left hand, the blade A, with the plate, would be inserted into the wool, which would not penetrate with that facility which shearers require.

Fig. 4 is the plate taken off, and shewn separate.

These drawings and this description will be sufficient for those who make shears, or for cutlers, who may easily make the addition requisite to the shears that they have already in their possession.

It may be imagined that if the lower blade of the shears were made as thick as the common blade and this plate together, it would have the same effect of preventing the skin of the animal from being cut: to prove that this will not be a sufficient guard, let a section of the shears be taken across the blades at EF, *Fig.* 5, (four times the size of the drawing, to make it more explanatory); now it appears evident, that when the edges of the plate, HH, come in contact (unless a very great pressure is made at the same time), the skin of the animal at G (which is represented by the dotted line SS) cannot be brought to meet the edges of the blades HH.

Whereas,

Whereas, supposing that the lower blade K, in the section I K, *Fig.* 6, were as thick as the common blade and the plate together, the skin at M, with a very little pressure, might be brought up close to the edges of the blades, and endanger its being cut. Such a blade as this would also take much time to sharpen. Now, admit that the lower blade is the same thickness as the last-mentioned blade (as the blade O in the section N O, *Fig.* 7), and let the lower part of this blade P be made so as to operate as the plate recommended; it will then be found that the edge of this blade is too obtuse to cut wool, although it may answer very well to cut substances of less flexibility.

If on trial it proves that there is no risk of cutting sheep with the shears I recommend, they must be of great service to indifferent shearers and to learners, as a learner may begin to practise without fear, and an indifferent

shearer may work with the greatest confidence; even to proficients they may become useful.

I am, Sir,

Your obliged humble servant,

JOHN MILLER.

June 12th, 1805.

CHARLES TAYLOR, Esq.

The

The SILVER MEDAL of the Society was this Session voted to SAMUEL TAYLOR, Esq. of Moston, near Manchester, for his EXPERIMENTS on the GROWTH of WHITE-THORN, and from whom the following ACCOUNTS were received.

Specimens of the Plants are reserved in the Repository of the Society.

GENTLEMEN,

EVERY one of you, I think, will allow that Fences are material objects to be attended to in Agriculture; you must also be convinced that there is no plant in this kingdom of which they can so properly be made as the Cratægus Oxyacantha Linnæi, or common White Thorn. In consequence of my being convinced of this, I have been induced to make a few experiments to effect

effect the better propagation of that valuable plant; the result of which, along with specimens of my success, I beg leave to submit to your inspection.

In the year 1801, I had occasion to purchase a quantity of thorns, and finding them very dear, I was determined to try some experiments, in order if possible to raise them at a less expense. I tried to propagate them from cuttings of the branches, but with little or no success. I likewise tried if pieces of the root would grow; and I cut from the thorns which I had purchased, about a dozen of such roots as pleased me, and planted them in a border along with those I had bought. To my great astonishment, not one of them died; and in two years they became as good thorns as the average of those I had purchased. The thorns I purchased were three years old when I got them. In April 1802, I had occasion to move a fence, from which I procured as many

many roots of thorns as made me upwards of two thousand cuttings, of which I did not lose five in the hundred.

In the spring of 1803, I likewise planted as many cuttings of thorn roots as I could get. In 1804, I did the same; and this year I shall plant many thousands.

I have sent for your inspection specimens of the produce of 1802, 1803, and 1804, raised after my method, with the best I could get of those raised from haws in the common way, which generally lie one year in the ground before they vegetate. They are all exactly one, two, and three years old, from the day they were planted.—I was so pleased with my success in raising so valuable an article to the farming interest of this kingdom, at so trifling an expense, (for it is merely that of cutting the roots into lengths and planting them) that I was determined to

make

make it known to the world, and could think of no better method than communicating it to your Society; and should you so far approve of this method of raising thorns, as to think me entitled to any honorary reward, I shall receive it with gratitude, but shall feel myself amply repaid for any trouble I have been at, should you think it worthy a place in the next Volume of your Transactions.

The method of raising the Thorns from roots of the plant, is as follows.

I would advise every farmer to purchase a hundred or a thousand thorns, according to the size of his farm, and plant them in his orchard or garden, and when they have attained the thickness of my three-year-old specimens, which is the size I always prefer for planting in fences, let him take them up and prune the roots in the manner I have pruned the specimen sent you, from which he will upon an average get

ten

ten or twelve cuttings from each plant, which is as good as thorns of the same thickness; so that you will easily perceive that in three years he will have a succession of plants fit for use, which he may if he pleases increase ten-fold every time he takes them up.

The spring (say in all April) is the best time to plant the cuttings, which must be done in rows half a yard asunder, and about four inches from each other in the row; they ought to be about four inches long, and planted with the top one-fourth of an inch out of the ground, and well fastened; otherwise they will not succeed so well.

The reason why I prefer spring to autumn for planting the roots, is, that were they to be planted in autumn, they would not have got sufficient hold of the ground before the frost set in, which would raise them all from the ground, and, if not entirely destroy the

plants,

plants, would oblige the farmer to plant them afresh.

I have attached the produce of my three-year-old specimen to the plants it came from, cut in the way I always practise; on the thick end of the root I make two, and on the other end one cut, by which means the proper end to be planted uppermost, which is the thick one, may easily be known.

Although I recommend the roots to be planted in April, yet the farmer may, where he pleases, take up the thorns he may want, and put the roots he has pruned off into sand or mould, where they will keep until he has leisure to cut them into proper lengths for planting; he will likewise keep them in the same way, until planted.

The great advantage of my plan is: first, that in case any one has raised from haws, a thorn with remarkably large

large prickles, of vigorous growth, or possessing any other qualification requisite to make a good fence, he may propagate it far better and sooner, from roots, than any other way. Secondly, in three years he may raise from roots a better plant, than can in six years be raised from haws, and with double the quantity of roots; my three-year-old specimen would have been half as big again, had I not been obliged to move all my cuttings the second year after they were planted.

It would not be a bad way, in order to get roots, to plant a hedge in any convenient place, and on each side trench the ground two yards wide, and two grafts deep; from which, every two or three years, a large quantity of roots might be obtained, by trenching the ground over again, and cutting away what roots were found, which would all be young and of a proper thickness.

I do

I do not like them of a larger size than the specimens sent.

I am at present engaged in several experiments, to endeavour to propagate the thorn from the branches, which, if successful, I will communicate to you; but I am of opinion, that what is now done is sufficient.

Should the Society require any further explanations, I shall be happy in doing my utmost to furnish such explanations.

SAMUEL TAYLOR.

Moston, near Manchester,
May 6th, 1805.

To the SOCIETY OF ARTS, &c.

A list of the Specimens sent.

No. 1 consists of four specimens of roots, which were planted the latter end of April, 1804; two with only one shoot a piece, and two with several.

No. 2

No. 2 consists of two specimens of the best one-year-old seedlings I could select out of 40,000 I purchased this spring, which in fact are two years old from the time the haws were gathered; for they generally remain one year in the ground before they vegetate.

No. 3 consists of two specimens of roots, planted the latter end of April, 1803, which have not been moved before since they were first planted; one with only one shoot, and the other with several.

No. 4 consists of the best two-year-old seedlings which I have been able to procure.

No. 5 consists of two specimens of roots, planted the latter end of April, 1802; which I was obliged to remove the spring after I first planted them; this of course retarded their growth, by having fresh roots to make. These spe-

cimens are pruned in the way I always prune thorns, when I plant them in my fences; the roots, you may see, are cut, and the top I should have cut at the mark you will find about four or five inches above the root, and shortened the branches below that mark, to about three inches from the stem. I have attached to each specimen the roots I pruned from it, cut into such lengths as I should have done had I used the thorns myself. I think one produced sixteen and the other twenty-two; but that you will be able to judge of when you see them.

No. 6 consists of the best three-year-old seedlings I could get; but both No. 4 and No. 6 labour under the same inconvenience as No. 2, from the haws remaining in the ground generally one year before they vegetate.

The

The SILVER MEDAL of the Society was this Session voted to Mr. W. WALLIS MASON, of Goodrest Lodge, near Warwick, for his Experiments on the CULTURE of CARROTS. The following ACCOUNT was received from him.

SIR,

THE purport of this communication is to explain with a degree of accuracy, the general, and as far as possible the best method to cultivate carrots. I shall therefore endeavour to set aside those prejudices, which frequently occur in every branch of agriculture; while I give a brief statement of particulars, which experience, assisted by numerous comparisons, has induced me to consider as best for adoption for

rearing the plants, as well as most judicious in the application of the vegetables when cultivated. In Suffolk, the culture of this highly valuable root has been carried on for ages; but of late years it has very much increased, and furnishes the best criterion of its worth; various have been the attempts to extend the benefit more generally throughout the kingdom, but with little success; imaginary difficulties arising in the minds of cultivators, which I hope to obviate by a more minute detail, the observance of which will enable any practical farmer, on a proper soil, to raise a crop, which will at once be productive of great private advantage and public utility. On most farms it will be found, that a considerable proportion of the produce from the best land (the meadow and upland pasture) is consumed by the laborious cattle, and the lean and rearing stock during the winter months. The carrot system may

be

be carried on, on inferior arable lands, and the produce, by judicious application, will be found to excel far beyond general expectation that of the grazing land, which will in consequence be appropriated to great national advantage, by furnishing an additional supply of animal food, of wool, and the produce of the dairy.

A red loamy sand is at all times to be preferred, as free from stones as possible; but very large crops may be grown on any land, which is not of a too tenacious or binding quality, with sufficient depth of soil.

In order to increase the luxuriance of the root, it is necessary to remove the soil to the depth of 14 inches: this is easily accomplished, by first ploughing the furrow seven inches deep in the usual manner, then follow with the second plough in the same furrow, which, by the assistance of an additional horse, brings up the soil from the depth

required. The first plough continues to turn the fresh furrow to the bottom of the double furrow, and being followed by the double furrow, as in the first instance, the soil becomes completely mixed and ready for the reception of the seed.

The first furrow is seven inches deep, and is removed into the .....
second furrow, of fourteen inches deep; this in rotation becomes the first stratum.

The lands, or stitches cannot be too wide, from 18 to 25 yards.

It is necessary to observe, the land at all times on which this crop is intended to be produced, should be in a perfectly clean state; a barley stubble which succeeded a fallow, &c. Yet few crops turn out more productive than those cultivated on clover, or lays of artificial grasses; ploughing the same as on a barley stubble.

A rule which in most instances holds good, must not here be neglected, that of getting in the seed directly after the ploughs; a neglect of this would be attended

attended with the worst consequences; on stale land the weeds would, in a short time, completely get the better of the young plants, and thereby occasion a great deficiency in the crop.

Five pounds of seed is commonly sown per acre; but as its value, comparatively speaking, is very trifling with the advantage of a good plant, I never recommend less than six pounds per acre. In a dry season there is a great benefit in steeping the seed for twenty-four hours; to prepare it for the drill, or for sowing, it should be well rubbed with the palm of the hand against the side of a tub, to destroy the small fibres and prevent their adhesion, and a proportion of fine sifted marl and saw-dust mixed with it; the proportion two-fourths marl, one-fourth saw-dust, to one-fourth of seed.

Drilling is indubitably the best way to get in the seed, from six to nine inches asunder: the advantage is obvious; the carrots stand the winter much better:

from the tops of the vegetables being nearly buried in the soil, the green head only is visible to the eye, and it is very rare to see the smallest part of the red carrot above the surface. An additional advantage in this mode of cultivation, is the great facility it furnishes in weeding and hoeing, which, in a district not hitherto acquainted with this useful branch of agriculture, must render it in a twofold degree desirable.

Carrots in the early state are very tender plants, and very slow in growth; I have frequently noticed a field scarcely visible to the eye, three weeks or a month after sowing, which has turned out a most abundant produce. It is frequently six weeks before they are fit to hoe; but to prescribe any rule is impossible, since the vegetation of every description of plants so much depends on the season. I shall only observe, the most proper time to commence weeding or hoeing, is soon after the plants gain the

the parsley leaf, or about half-inch out of the ground. Every vegetable intended to be thinned or separated by the hoe, cannot well be done too early, since from general observation it is clearly ascertained, that the smaller the plants, the greater is the number left; and as a second hoeing is absolutely necessary (if it is only to promote vegetation by loosening the surface), the plants may then be distributed as requisite. In hoeing of every description, it is always necessary to stir every part of the soil possible; in this instance it must on no account be neglected.

The season for sowing, is from the middle of March to the 12th of April. In dry weather it is best to leave the seed rolled down. The land should always be harrowed after drilling or sowing; from the nature of the plant, a pulverization of the soil is requisite. It is, however, useless to detail particulars of this sort, which must in so material

terial a degree depend on the state of the season, in which the judgment of the practical farmer cannot easily fail; suffice it to say, the lighter, the finer, and the less binding the soil, the better vegetation must flourish.

With respect to the best method of cleansing the young crop, I have only to observe, that nine times in ten it answers better to weed by hand, than to hoe the first time; this rests on a supposition, that the crop is much encumbered by weeds; on the contrary, (which is rarely the case) supposing it perfectly clean, the hoe will answer every purpose requisite. There is great judgment to be observed in the first hoeing, particularly to leave the plants sufficiently thick, and not to bury them in the process; should this be done, your fairest prospects will at once vanish. The women and children employed to weed, should not be suffered to pull a single carrot plant; the hoe effects

fects the purpose of setting out in a superior manner, and should within two or three days follow the weeders. I have frequently seen the land so much covered with weeds, that the plant of carrots was extremely doubtful; after hand-weeding, a very good plant was seen, which would have been destroyed in great measure, had the hoe been previously used. One weeding and two hoeings are generally sufficient; by the time they are accomplished, the carrot-tops generally are of sufficient growth to shade the land. The proper hoe to be made use of should be 4 inches, by $1\frac{1}{2}$ inch of the adjoining Figure, and always kept very sharp.

Carrots

Carrots, like turnips, and other vegetables intended to be housed for winter, should not be taken up before they are full grown; they never answer better than when used from one to four weeks after they are out of the ground. They are little liable to injury in winter; the latest time for taking up, is just before the fibrous roots begin to shoot in the spring; at which period the vegetable becomes less nutritive, at the same time injurious to the land.

By these attentions I have invariably found the cultivation of carrots extremely beneficial to the land, and not unfrequently the value of the crop equal to the fee-simple of it. The greatest produce I ever remember was eighteen loads per acre, forty heaped bushels to the load; yet I have heard of much larger crops.

Worn-out ploughed lands are renewed by the intermixture of fresh soil occasioned by the deep ploughing; and the

proof

proof is visible in many succeeding crops of corn, grasses, &c.

The same land will produce very good crops of carrots for years in succession; but in this instance manure becomes necessary. They are taken up with a narrow spade, which the labourer strikes with one hand into the ground, pressing it sideways at the same time; he draws the root with the other, throwing it to the heap, where sit his wife and children to cut off the tops: the tops are left and spread as manure to the land.

Expenses of Labour.

	s.	d.
Weeding varies from 5s. to 10s. per acre, average	7	6
First Hoeing	7	0
Second do.	5	6
Taking up per load, and topping	1	2

Observing these prices, it is necessary to remark, the labourers, in dear seasons, have an allowance for flour.

To

To every single man one stone of flour per week, the master paying the additional price above two shillings per stone.

To a man and his wife one stone and a half per week, and half a stone per week to every additional child under twelve years old, at which time they are deemed capable of earning their own bread.

By the introduction of this judicious plan, the labourer shares the benefit of that grain which his own industry had helped to cultivate, and feels but in a small degree the oppression of the times; the interest of the master and the servant becomes reciprocal, for the price of labour continues nearly at the usual standard; had it been otherwise, the farmer must have suffered when his commodities became of less value.

The annual rent of those lands on which carrots are generally grown, is from 5*s*. to 20*s*. per acre; but I have invariably

invariably found the profit by far the greatest when the best soil has been made use of:—

A good crop on land worth 5s. per acre.... 7 loads.
———— on land worth 10s. per acre .. 9 do.
———— on land worth 15s. per acre ..11 do.
On the best land, as I before remarked ....18 do.

The advantage in preferring good land is obvious, the chief expenses being nearly the same as on poor soil; the additional labour consists chiefly in taking up.

Carrots are sometimes sown when the land has received but a single furrow, a sure badge of indolence. The annexed Drawing is to prove the necessity of deep ploughing, by means of the double furrow. *Fig.* 1. is the shape and comparative size of a carrot grown on a single furrow; the earth below where the soil was stirred, acting as a repellent, checks the growth of the root, and causes it to shoot laterally.

Fig. 1.

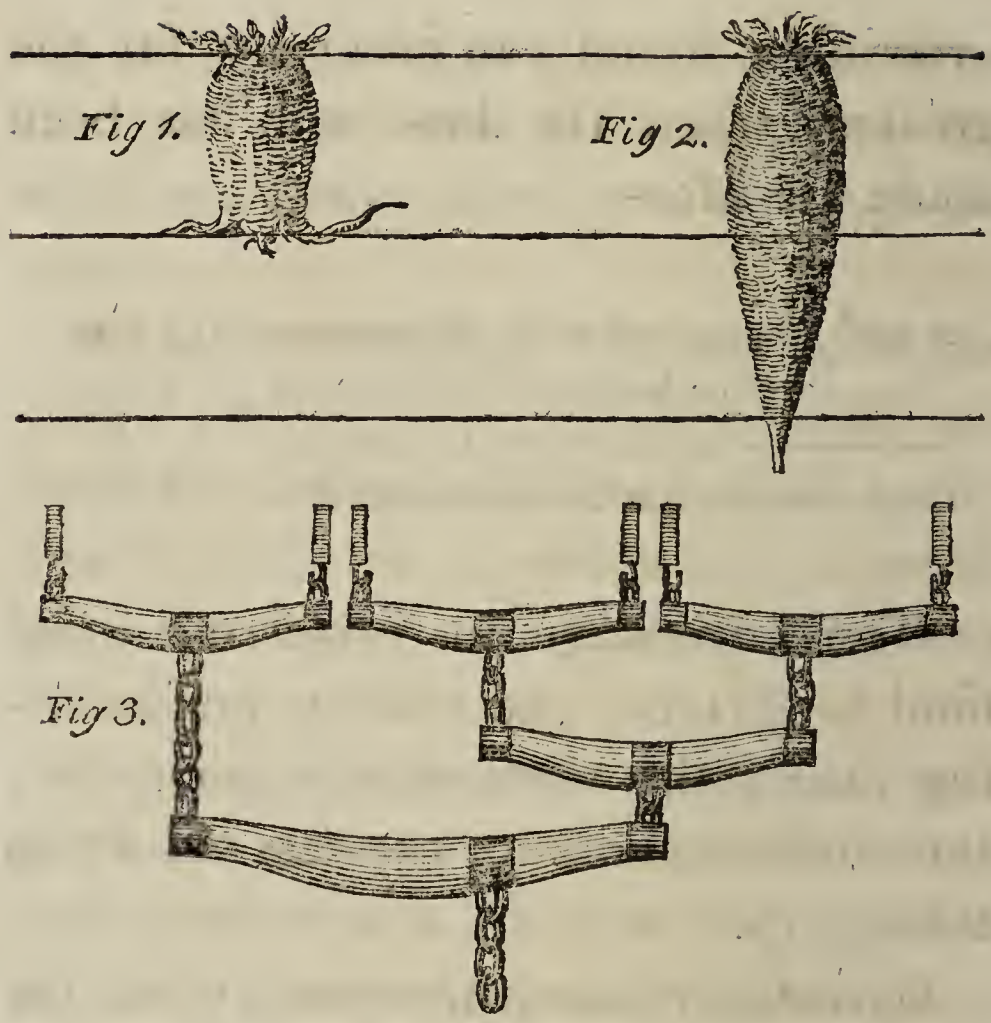


Fig. 2 is the comparative growth and shape of a carrot grown on the double furrow. On all soils which are adapted to this branch of husbandry, the first ploughing may be done by a pair af horses abreast; the lower, or double furrow, by three horses abreast. The nearer the cattle are to the work, the greater the purchase; they labour with greater spirit in sociable pairs than in a drone-

a drone-like string at length. The adjoining *Fig.* 3 will explain the manner of fixing three horses abreast to a single purchase, which will be found on a fair trial to equal four horses at length.

It is a common custom with the cultivators of carrots to raise their own seed: it requires little attention, and the crop is seldom known to fail.—For this purpose choose such carrots as are in no respect injured by frost; and the handsomest of a middle size; trim the green top, leaving about an inch of it, and cut two inches off the extremity of the root. Plant them in double rows, a foot wide, and six inches in the row; the interval of the double rows three feet: this is requisite, as the seed does not ripen together. The path or interval serves to gather the seed, which must be done daily as the heads of seed arrive at maturity: it is frequently three weeks before the crop is

cleared. Spread the heads of seeds to dry on a floor, or in dry weather, on the ground; afterwards separate the seed from the stalks with a comb. The season to plant carrots for seed, is the latter end of February or the beginning of March, when the severe frosts are over.

Having explained, in as concise a manner as possible, what is necessary to be observed, to enable the practical farmer to cultivate this highly valuable root, in districts hitherto deprived of the great benefit it affords to the community, and the great profit to the cultivator, free from all theoretical and speculative opinions, I proceed to a short detail of the use and application of carrots when cultivated. On their utility for family consumption, it will not be necessary to dwell; I have therefore only to remark, since vegetables are found to be more or less nutritive in proportion to the saccharine matter

they

they contain, but few vegetables will be found to excel them. I have known large crops of carrots sold, for the London market, at forty shillings per load, delivered at a port four miles distant from the land, which produced them a price for which a ready sale will be found in any populous town, during the winter season: for this purpose they should be assorted; all the over-grown and crooked ones reserved for home consumption, for which they will answer as well as the others; and when topped, half an inch of the green crown left on: for this purpose they are not usually washed. For home consumption I have invariably found them to answer best for the use of cart-horses; when designed for the food of other cattle, of any description, the green top must be entirely cut off, and the carrots washed perfectly free from dirt and sand. It is necessary to house them three or four days at least before

horses are fed with them; a neglect of this is sure to be attended with dangerous consequences. It is generally known that the cucumber, when left a short time in water, absorbs a proportion of it; the carrot does the same, in a less degree, yet sufficiently to produce a considerable degree of fermentation by the heat of the animal's stomach; and griping is occasioned thereby. To render them salutary, the time mentioned is sufficient for evaporation.—Washing is easily and expeditiously done, by putting a large mash-tub, three parts full of carrots, then pouring cold water on them, stir them, and throw them out with four-pronged muck-forks; after which process they may be laid under cover in large heaps, as much as six or eight loads in a heap; secured from frost and rain, they will keep two or three months: it is however not right to suffer them to remain so long, in which case they shrivel even

to

to two thirds of measure; and although they become more nutritious, from the loss of aqueous particles, it is not sufficient to compensate the deficiency. Carrots are extremely valuable when applied as food for cart-horses: when properly fed with them, they are in the greatest vigour and health; and their coats are as fine as the best-groomed coach-horses, even in the depth of winter, and exposed to the inclemency of the season in a straw-yard. For home consumption, I have invariably found them to pay more, by one-third, when given to horses, than to feeding cattle. After a variety of experiments, I have found the following manner of applying them to be the best:—To each cart-horse, one heaped bushel per day, with as much cut provender as he could eat; the latter should be of the first quality. I recommend two-thirds good wheat or oat straw, and one-third clover. Wheat-straw is best; oat-straw

next. Barley-straw is frequently given; but never preferred, from its griping tendency. Horses cannot eat too much cut food. When returned from work, they should always be baited with it, or drink their water before carrots are given, and plenty of dry food given with the carrots: the dry nature of the one corrects the cold quality of the other. There is not any occasion to cut the carrots, but to mix them with the cut food, and feed them in the manger. Horses used to carrots will prefer them to oats, when given together. If the straw and clover are not of the first quality, oats should be given in proportion. By this method of feeding, there is a saving of at least two-thirds of the hay usually consumed; corn is dispensed with; and horses will be in better condition than when fed with hay and corn only, supposing each horse is allowed with hay half a peck of oats per day.

Great

Great care must be taken never to give carrots when horses come to the stable heated by work.

Carrots are not proper food for riding-horses; nimble exercise causes them to be laxative; and as they will sometimes produce griping, I shall insert a prescription which has been proved by long experience, together with the treatment to be pursued in such cases.

Oil of Turpentine	1 oz.
Castile Soap	1 oz.
Flour of Mustard	½ oz.

On the first symptom this mixture should be given, and it will not fail to remove the complaint. The Castile soap to be cut fine, and dissolved in a quart of boiling water, the mustard added; the oil of turpentine the last thing; it should be given more than milk-warm; if the animal suffers much pain, add half an ounce of liquid laudanum. On the first appearance of the disease,

the horse should be well coated, and constantly rubbed with hard twisted whisps of straw, and kept as warm as possible; should the disease increase, and the body swell much, a gallon of blood should be taken, to check the inflammation, and give time for the medicine to operate. If the symptoms increase, repeat the dose, omitting the liquid laudanum. Clysters and raking afford much relief when the symptoms first appear, and frequently remove the complaint.

Feeding cattle improve more on carrots, than when fed with potatoes or turnips; they are excellent food for ewes at lambing time, and should be cut, or they are subject to break their mouths.

Store pigs may be fattened on carrots only, and large hogs feed remarkably well, when fed with half corn and half carrots.

Heifers

Heifers in calf, which require good keep and calve early, thrive better on carrots and good oat straw, than on hay only—one bushel of carrots per day—care must be taken not to give them too early or too many; in which case, the calves are liable to overgrow.

Weaned calves thrive well on this food; a peck per day is quite sufficient, more would increase the body too much.

Milking cows give more milk on carrots and straw, than on hay only. In all these instances their superiority over turnips is more, comparatively speaking, than the difference of a carrot crop rated at one guinea per load of forty bushels, to the value of turnips on the same soil; rating them as a produce for home consumption.

One heaped bushel of carrots, therefore, is equal to 18 lbs. of hay. Admitting each cart-horse to consume this quantity

quantity of hay for 120 days, it amounts to 2,160 lbs. the average produce of one acre of good pasture land.

The same animal, if fed on carrots, with the addition of the cut-straw provender, which is a substitute for corn, and adds solidity to the carrots, will require only 120 bushels of carrots, or three loads; not half the produce of an acre of arable land worth five shillings per acre.

To this must be added the great superiority in point of condition, which the cattle evince. The latter method of feeding with carrots and cut provender, is fully equal to 18lbs. of hay and half a peck of oats to each horse.

My object in presenting the above remarks, for the consideration of the Society for the Encouragement of Arts, &c. &c. is the hope of extending a most valuable branch of Agriculture (which has

has long stood the test of experience) more generally throughout the kingdom, and is respectfully submitted to them by their obedient servant,

W. WALLIS MASON.

Goodrest Lodge, near Warwick,
January 31st, 1805.

CHARLES TAYLOR, Esq.

The

The SILVER MEDAL of the Society was was this Session voted to Mr. JOHN FAREY, No. 12, Upper Crown-street, Westminster, for Experiments on the GROWTH of TIMBER TREES. The following Communications were received from him.

A PLAN of the Plantation referred to, called Brown's Wood, is hereunto annexed, and is the plantation described as 19 acres, in the First Volume of the Society's Transactions, p. 133.

SIR,

IN the year 1778, Mr. Francis Moore, of Aspley-Guise, in Bedfordshire, planted four pieces of sandy land with Scotch, and a few other fir plants, plans of which were laid before the Society of Arts, &c. with certificates in the usual form, and the Gold Medal adjudged

The Plan of a Plantation called *BROWNS WOOD*, in the Parish of Wavendon Bucks, 2½ Miles from Woburn in Bedfordshire. *The Property of* HIS GRACE THE DUKE OF BEDFORD.

Scale of Chains.
0 1 2 3 4 5
Late the
Common Heath of Wavendon Planted About 1791.
The Common Heath of Aſpley Guise, in the County of Bedford.
B
Morafs or Bog.
C
D
E
F
An ancient Lane called Tiardwick Lane, & shut up on the Incloſure of Wavendon in 1789.
An ancient Inclosure of Wood in Wavendon.

Contents

	A	R	F	A. R. P
A	0	0	21	
B	3	3	27	
C	0	2	25	10. 0. 21
D	3	2	33	
E	1	2	35	
Ridings	0	0	35	
Bog	0	0	20	0. 3. 32
Fences	0	2	17	
				11. 0. 13

S. Porter sculp.

adjudged to Mr. Moore for these Plantations. Accounts thereof are preserved in the First Volume of the Society's Transactions. Several circumstances concurred in the year 1794 to induce me, with the approbation of the late Duke of Bedford, to whom two of these plantations then belonged, to have all the trees growing in one of the plantations in Wavendon carefully counted, measured, and valued, in order to determine by an accurate and large experiment, the actual growth and improvement in this plantation, at the distance of sixteen years from its being planted.

In order to deduce several different averages, a new and very accurate plan of this plantation was made, and of five several parts into which it was divided. Conceiving that these particulars may prove interesting and useful to gentlemen concerned in planting, or who wish to make calculations on such improve-

improvements, I have drawn out a detailed account of these operations, with remarks referring to a plan of this plantation, which I beg to submit to the consideration of the Society; in hope that they will give the same a place in their next Volume of Transactions, together with a re-measurement of one of those divisions of the plantation, to record the progress of the trees therein, at twenty-six years from their planting; for which last particulars, I am indebted to my friend, Mr. Robert Salmon, of Woburn Park, who will probably at a future period furnish you with further remarks of considerable utility, on the progress and management of this and other young plantations.

I am, Sir,

Your obedient servant,

JOHN FAREY.

12, *Upper Crown-street, Westminster,*
May 1*st*, 1805.

Mr. CHARLES TAYLOR.

Reference

Reference to the ENGRAVING *of the* PLANTATION, *called Brown's Wood, in the parish of Wavendon, Bucks, with* Mr. FAREY'S *remarks thereon. See* Plate II.

SIR,

BEFORE entering on the measurement and other observations, which I beg to have the honour of submitting to the Society of Arts, &c. relative to a plantation in Wavendon, I beg leave to mention some circumstances which led to these inquiries on my part.

I was one among a number of other persons of the neighbourhood of Aspley-Guise, a village on the western border of Bedfordshire, whom Mr. Francis Moore invited to meet him on the 8th of March, 1794, to inspect his plantations, and other improvements; and

and I accordingly accompanied Mr. Moore and five other gentlemen through several of the plantations which he had made: it was particularly stated to us by Mr. Moore, while we were viewing a plantation of firs in Wavendon parish, Bucks, called *Brown's Wood*, that this was one among the plantations for which he was honoured with the gold medal in the year 1779, from your very excellent and useful Society. The particulars of the time of planting, ages of the plants, &c. he stated to us from a book then in his hands, and shewed us five or six trees in Brown's Wood, which had been recently marked and numbered, of which trees he stated the dimensions and value; informing us, that the same had been measured and ascertained a few days before, by Mr. Malcolm, who was then collecting materials for his Report to the Board of Agriculture on the county of Buckingham. From the terms of our invitation, and

the

the nature of Mr. Moore's conversation as we passed through his plantations, I expected that he had some report prepared, to be presented to your Society, or to the Board of Agriculture, on the progress and value of these plantations, and to which he wished our certificates; we separated, however, without any such thing being produced or mentioned; but an idea was from that time imprinted strongly on my mind, of the utility of periodical and accurate inspections, to note the growth and increasing value of plantations like these, especially of such, whose planting has been recorded and honoured by the notice of so respectable a body as your Society. Soon after this, *Mr. Malcolm's Agricultural Report on the county of Bucks* was published, in which, at pages 41 and 42, and 52 to 54, there is an account of this plantation; and of your Society having honoured the owner with a gold medal; and this determined

me, with the approbation of *his Grace the Duke of Bedford*, to have all the trees in Brown's Wood, which then belonged to his Grace, and was under my care, carefully counted and measured, and to keep thenceforward an exact account of all the thinnings, or produce from it, and to repeat the counting and measuring, at intervals of eight or ten years, or oftener. Although circumstances have prevented the full accomplishment of my intentions on this subject, I hope that the following account of the measurements of the trees growing in this wood in 1794, may not be unacceptable to your Society; and I have detailed the methods which I took, from a hope it may stimulate others to furnish you with accurate and periodical measurements of the trees in some of the plantations, whose origin has been stated in the volumes of your Transactions; being convinced, that much good would result from the publication

at

at length, of a number of such particulars, in ascertaining the best procedure in thinning and managing young plantations, and of the comparative value of different kinds of trees; besides furnishing accurate data or averages, for estimating the value of other similar plantations, without the great labour of measuring the whole.

Having procured a *measuring tape*, prepared with oil colours (such as are now made by Mr. Cary, optician, in the Strand, for measuring timber), having inches on one side, numbered on from one to ten, twenty, thirty, &c. without beginning again at the end of each foot, its other side being divided into feet and quarters of feet; having also provided a small tin kettle with a quantity of whiting and size, prepared as for white-washing, and a painter's brush; a book ruled from top to bottom into columns, each about half an inch wide, being also in readiness;—on the 15th of

July, 1794, I caused the measurement to be begun by a man and two boys. This man, who then resided at Bowbrick-hill, is named *James Smith*, a very steady and competent person: his business was to take the circumference of each tree, at the height of four feet from the ground, which height was readily ascertained by a particular button or mark on his waistcoat. One of the boys constantly attended on one side of him with the book, and, as soon as he called out the inches which the tree girted, wrote it down; the other boy, advancing on the other side, immediately made a stroke of whiting around the tree, about the place that had been measured; this was for distinguishing those trees which had been measured. On the second day I directed that such of the smaller trees as were found not to exceed four inches in circumference, at four feet high, should have their height measured instead of their circumference,

for

for which purpose the man held the ring of the tape to the extreme branch or leader of the tree; and when this was above his reach, using a stick, with a hook or notch in its end to receive the ring of the tape to hold it up by, while one of the boys stretched the tape to the ground and read off the feet, which were regularly entered by the other boy one under another, in the book, along with the girts, only distinguishing these by the letters *ft.* after them; this was done to prevent the trouble and risk of mistake, in having different columns in use at the same time; every alternate column was also left blank for room to note the kinds of trees (except the Scotch firs, of which the plantation principally consisted) by the words, *Spruce*, *Pine*, *Larch*, &c. after the girt. The planting in Brown's Wood being divided by ridings or ditches, into five distinct pieces, in order to render the experiment more complete, I directed

each one of these in succession to be completed, and the accounts of each to be distinguished in the book.—I attended frequently to see that my orders were observed, and in a few days the whole wood was got through; the account extending to twenty pages of fools-cap paper. I now determined upon dividing the trees into *classes*, according to their girts, calling all those which girted five, six, seven, eight, &c. inches (at four feet high) the fifth, sixth, seventh, eighth, &c. classes; and, having prepared a sheet of paper with columns and room for the dimensions of five or six trees in each class, on the 30th of July I went to Brown's Wood, and Smith assisted me in measuring one hundred and eight trees, which we performed with every regard to accuracy, in four hours and a half. Our method of selecting the trees was, in walking through the wood in different directions, to select a tree out of several others near

it,

it, to which it appeared similar in growth and size: the tree so selected, was girted at four feet, to refer it to its proper class, and it was then measured, by help of a ladder and a slight pole or rod, to elevate the ring of the *length tape*, to such a height in the tree as it could be used, if cut down, either for rafters of slight buildings, for rails, or for stakes in temporary fences, &c.: in this I was governed by our custom of cutting off the top of the thinnings of this, and similar plantations for sale. The tape being held, I stretched it to the ground, and read the feet from the *black* side thereof, which I took down on the sheet of paper in the column for lengths, under the proper class; Smith, being at the same time upon the ladder, without lowering or altering the position of the tape, looked for the same figure on the *red* side of the tape, which I had read, and which was called out to him, and level with, or opposite

thereto, he found the proper girting place, or middle of the length to be measured of the tree. After handing the pole down, Smith took the circumference at that place with the tape first mentioned, and read the inches which I wrote down against the length. The *girt tapes*, also made by Cary, are calculated to take the quarter girt at once, which is a great saving of time in measuring large timber; but in an experiment on such small trees as these, to avoid so many fractions, it is better to use the *inch tape*. The nearest foot in the heights, and inch in the circumferences, were set down, rejecting or adding the fractional part when less than half a foot or inch; and I made no allowance for the bark of the trees, it not being usual with us to do so, in selling similar fir-trees to these, from the thinning of plantations here. I should remark, that when Smith on the 15th of July began: the girts of such trees as measured two,

three,

three, and four inches round (at four feet high) were set down, but on considering next day the minuteness of the solid contents of such trees, we went back and measured the extreme heights of several of these trees, and found them to average seven, nine, and eleven feet respectively, and after that the heights of such trees were set down as before mentioned, instead of their girt; such as were above six and a half, and did not exceed eight feet in height, were set down seven; such as measured between eight and ten were set down nine; and those between ten and twelve, were set down eleven; which is the reason that no eight and ten feet heights appear in the following abstracts. In order that the Gentlemen of your Society may be able to judge, how nearly I have obtained a correct average content of the trees in each class, I have below copied the whole of the dimensions which were taken.

DIMENSIONS

DIMENSIONS of 108 TREES growing in Brown's Wood Plantation, 30th July, 1794.

Class, or circumference at four feet high.	Height measured in feet.	Whole girt in the middle, in inches.	Contents in feet and duodecimals	Mean contents in feet; observations, &c.
4th	8	4	$\frac{8}{144}$	11 feet high
	7	4	$\frac{7}{144}$	
	6	4	$\frac{6}{144}$	mean $\frac{7}{144}$
5th	11	4	$\frac{11}{144}$	
	7	5	$\frac{11}{144}$	
	6	6	$\frac{14}{144}$	
	8	5	$\frac{13}{144}$	a pine
				mean $\frac{1}{12}$
6th	8	7	$\frac{24}{144}$	
	8	6	$\frac{18}{144}$	
	11	6	$\frac{25}{144}$	a spruce
	10	6	$\frac{23}{144}$	
	11	6	$\frac{25}{144}$	
	7	6	$\frac{16}{144}$	mean $\frac{2}{12}$
7th	15	6	$\frac{3}{12}$	
	$16\frac{1}{2}$	6	$\frac{3}{12}$	
	12	6	$\frac{2}{12}$	
	10	7	$\frac{3}{12}$	
	10	7	$\frac{3}{12}$	
	12	6	$\frac{2}{12}$	
	12	7	$\frac{3}{12}$	mean $\frac{2\frac{1}{2}}{12}$

DIMENSIONS of 108 TREES growing in Brown's Wood Plantation, 30th July, 1794, continued.

Class, or circumference at four feet high.	Height measured in feet.	Whole girt in the middle, in inches.	Contents in feet and duodecimals	Mean contents in feet; observations, &c.
8th	$19\frac{1}{2}$	6	$\frac{4}{12}$	
	$10\frac{1}{2}$	8	$\frac{3}{12}$	
	12	7	$\frac{3}{12}$	
	12	7	$\frac{3}{12}$	mean $\frac{3}{12}$
9th	18	7	$\frac{5}{12}$	
	21	7	$\frac{5}{12}$	
	13	8	$\frac{4}{12}$	
	15	7	$\frac{4}{12}$	a pine
	16	7	$\frac{4}{12}$	
	14	8	$\frac{5}{12}$	mean $\frac{4\frac{1}{2}}{12}$
10th	20	8	$\frac{7}{12}$	
	17	9	$\frac{7}{12}$	
	12	10	$\frac{6}{12}$	
	15	9	$\frac{6}{12}$	
	15	9	$\frac{6}{12}$	mean $\frac{6}{12}$
11th	17	9	$\frac{7}{12}$	
	22	9	$\frac{8}{12}$	
	24	9	$\frac{9}{12}$	
	15	10	$\frac{8}{12}$	mean $\frac{8}{12}$
12th	15	9	$\frac{6}{12}$	
	22	9	$\frac{9}{12}$	
	14	10	$\frac{7}{12}$	
	15	10	$\frac{8}{12}$	mean $\frac{8}{12}$
13th	15	10	$\frac{8}{12}$	
	17	11	$\frac{11}{12}$	a pine
	17	11	$\frac{11}{12}$	
	$15\frac{1}{2}$	11	$\frac{10}{12}$	
	15	11	$\frac{9}{12}$	mean $\frac{10}{12}$

DIMENSIONS

DIMENSIONS of 108 TREES growing in Brown's Wood Plantation, 30th July, 1794, continued.

Class, or circumference at four feet high.	Height measured in feet.	Whole girt in the middle, in inches,	Contents in feet and duodecimals	Mean contents in feet; observations, &c.
14th	17	11	$\frac{11}{12}$	
	20	10	$\frac{10}{12}$	
	17	12	1	
	16	13	$1\frac{2}{12}$	
	14	13	1	mean 1
15th	18	13	$1\frac{4}{12}$	
	22	12	$1\frac{5}{12}$	
	14	14	$1\frac{2}{12}$	
	25	11	$1\frac{4}{12}$	
	20	13	$1\frac{6}{12}$	a pine
	17	13	$1\frac{3}{12}$	mean $1\frac{4}{12}$
16th	18	13	$1\frac{4}{12}$	
	17	13	$1\frac{3}{12}$	
	21	11	$1\frac{1}{12}$	
	21	14	$1\frac{2}{12}$	
	14	15	$1\frac{4}{12}$	
	23	13	$1\frac{8}{12}$	
	16	14	$1\frac{3}{12}$	
	18	13	$1\frac{3}{12}$	No, 2, near N.E. corner
				mean $1\frac{5}{12}$
17th	23	13	$1\frac{8}{12}$	
	24	13	$1\frac{9}{12}$	
	16	15	$1\frac{7}{12}$	
	22	13	$1\frac{7}{12}$	
	22	13	$1\frac{7}{12}$	mean $1\frac{7}{12}$
18th	19	13	$1\frac{5}{12}$	
	21	13	$1\frac{7}{12}$	
	21	15	2	
	15	16	$1\frac{8}{12}$	
	19	14	$1\frac{8}{12}$	a pine
				mean $1\frac{8}{12}$

DIMENSIONS

DIMENSIONS of 108 TREES growing in Brown's Wood Plantation, 30th July, 1794, continued.

Class, or circumference at four feet high.	Height measured in feet.	Whole girt in the middle, in inches.	Contents in feet and duodecimals	Mean contents in feet; observations, &c.
19th	17 $\frac{1}{2}$	16	1 $\frac{11}{12}$	
	17	15	1 $\frac{8}{12}$	
	23	16	2 $\frac{6}{12}$	
	15 $\frac{1}{2}$	14	1 $\frac{4}{12}$	
	13	18	1 $\frac{10}{12}$	mean 1 $\frac{10}{12}$
20th	23	16	2 $\frac{7}{12}$	
	25	14	2 $\frac{1}{12}$	
	12	18	1 $\frac{8}{12}$	
	25	15	2 $\frac{6}{12}$	
	14	17	1 $\frac{9}{12}$	at S.E. corner
	15	16	1 $\frac{8}{12}$	mean 2
21st	21	14	1 $\frac{9}{12}$	
	23	16	2 $\frac{7}{12}$	
	24	16	2 $\frac{8}{12}$	
	16	18	2 $\frac{3}{12}$	
	20	17	2 $\frac{6}{12}$	
	12	19	1 $\frac{10}{12}$	mean 2 $\frac{4}{12}$
22d	20 $\frac{1}{2}$	16	2 $\frac{3}{12}$	
	22	17	2 $\frac{9}{12}$	{ No. 1, at W. corner of C
	21	18	2 $\frac{11}{12}$	
	24	17	3	mean 2 $\frac{9}{12}$
23d	19	19	3	
	24	18	3 $\frac{4}{12}$	
	20	18	2 $\frac{10}{12}$	mean 3
24th	17	17	2 $\frac{2}{12}$	
	20	18	2 $\frac{10}{12}$	
	25	18	3 $\frac{6}{12}$	
	19	19	3	mean 2 $\frac{10}{12}$
26th	14	24	3 $\frac{6}{12}$	outside, top broken
	11	23	2 $\frac{6}{12}$	N.E. corner, ditto
				mean 3
27th	21	21	4	outside, top broken

It

It may not be amiss, to mention the mode of calculation when the circumference is taken in inches, instead of the *one-fourth girt* to which the tables and slide-rules in use are adapted, viz. Square the girt, or multiply it by itself; multiply this by the feet in length, and divide the product by 2304*, the quotient is the content: thus, in the first tree in the 20th class (16×16×23)÷2304=2, with 1280 remaining, and (1280 multiplied by 12)÷2304=7; the contents therefore is $2\frac{7}{12}$ feet. The remaining business was done by Smith and my brother, Benjamin Farey, in my office at Woburn. The original book was first carefully looked over, and all the figures which had *ft.* against them were circled round with a pencil, to distinguish them; so were the *spruce*,

* Because the girt is four times too much before squaring, and 144 square inches make a foot, therefore 4×4×144=2304 is the divisor for reducing to the customary or *round measure.* See a paper on this subject in *Tilloch's Phil. Mag.* No. 75, vol. xix. page 213.

pine,

pine, *larch*, &c. A paper was then ruled into upright columns, about a quarter of an inch wide, and on the top, the classes 5th, 6th, 7th, 8th, &c. were written; a person then read over the girt of the Scotch firs, while another marked with a pencil each time under the proper class; in this way they proceeded till a page of the original book was got through, or till they had come to the end of one of the five divisions of the wood; the number of marks under each class were then counted, and set down under each other regularly; in like manner the small Scotch firs of 1, 2, 3, 4, &c. feet high were separately collected, and set down under the proper classes. The trees of other kinds in that page were then collected into classes, and the small ones arranged and added, and the whole were added to the Scotch firs; the total number of trees in that page of the original book was then counted, and if

it did not agree with the collected total, the whole was gone over again; and thus each page was proved to be rightly collected. The above totals were then collected from each page on a sheet of paper, ruled and entitled as in the following abstracts, and the totals when collected for each division of the wood, and kind of tree, stood as in the folding pages opposite.

The number of *Scotch firs* in the 5th, 6th, 7th, &c. classes were then collected in succession, from each of these four abstracts; the same was done for the *spruce*, *Weymouth pines*, and *larch;* and in order to ascertain the measure or cubic contents of the trees which had been measured, in each class of the different kinds, the four following Tables were drawn out.—The numbers in the column entitled "Feet per Tree," being taken from the measurement of the 108 trees before given.

I. Calcu-

I. Calculations of Scotch Firs.

Class.	No. of Trees.	Feet per Tree	Contents
5	1490	$\frac{1}{12}$	124
6	1475	$\frac{2}{12}$	245½
7	1784	$\frac{2}{12}$	371½
8	1783	$\frac{3}{12}$	445
9	1677	$\frac{4}{12}$	628½
10	1648	$\frac{6}{12}$	824
11	1376	$\frac{8}{12}$	802½
12	1091	$\frac{9}{12}$	818
13	765	$\frac{10}{12}$	637½
14	491	1	491
15	312	$1\frac{4}{12}$	416
16	206	$1\frac{5}{12}$	291½
17	152	$1\frac{7}{12}$	240½
18	88	$1\frac{8}{12}$	146½
19	65	$1\frac{10}{12}$	119
20	44	2	88
21	20	$2\frac{4}{12}$	46½
22	12	$2\frac{9}{12}$	33
23	7	$2\frac{10}{12}$	19½
24	6	3	18
26	4	3	12
27	1	4	4
Total	14497	—	6822

II. Calculations of Spruce Firs.

Class.	No. of Trees.	Feet per Tree	Contents
5	11	$\frac{1}{12}$	1
6	5	$\frac{2}{12}$	1
7	3	$\frac{2}{12}$	½
8	3	$\frac{3}{12}$	½
9	3	$\frac{4}{12}$	1
10	—	$\frac{6}{12}$	—
11	1	$\frac{8}{12}$	½
12	1	$\frac{9}{12}$	½
Total	27	—	5

III. Calculations of Weymouth Pines.

Class.	No. of Trees	Feet per Tree	Contents
5	13	$\frac{1}{12}$	1
6	9	$\frac{2}{12}$	$1\frac{1}{2}$
7	2	$\frac{2\frac{1}{2}}{12}$	$\frac{1}{2}$
8	11	$\frac{3}{12}$	$2\frac{1}{2}$
9	5	$\frac{4\frac{1}{2}}{12}$	2
10	3	$\frac{6}{12}$	$1\frac{1}{2}$
11	3	$\frac{8}{12}$	$1\frac{1}{2}$
12	3	$\frac{9}{12}$	2
13	3	$\frac{10}{12}$	$2\frac{1}{2}$
14	3	1	3
15	4	$1\frac{4}{12}$	5
16	—	$1\frac{5}{12}$	—
17	—	$1\frac{7}{12}$	—
18	2	$1\frac{8}{12}$	$3\frac{1}{2}$
19	1	$1\frac{10}{12}$	2
Total	62	——	$28\frac{1}{2}$

IV. Calculations of Larch Trees.

Class.	No. of Trees.	Feet per Tree	Contents
5	1	$\frac{1}{12}$	$\frac{1}{12}$
6	1	$\frac{2}{12}$	$\frac{2}{12}$
7	—	$\frac{2\frac{1}{2}}{12}$	—
8	—	$\frac{3}{12}$	—
9	—	$\frac{4\frac{1}{2}}{12}$	—
10	2	$\frac{6}{12}$	1
Total	4	—	$1\frac{3}{12}$

I. An

I.—An Abstract of the *Scotch Fir* Trees which were growing, in July 1794, on the small triangular part of Brown's Wood, containing 0A. 0R. 21P. marked A on the plan annexed, at the south-west corner *, bounded on the south-west by a fence against the common heath of Aspley (in Bedfordshire), on the north-west by a fence against a young plantation of the Duke of Bedford's in Wavendon, and on the north-east by the broad straight Riding which points to Bowbrick-hill steeple.

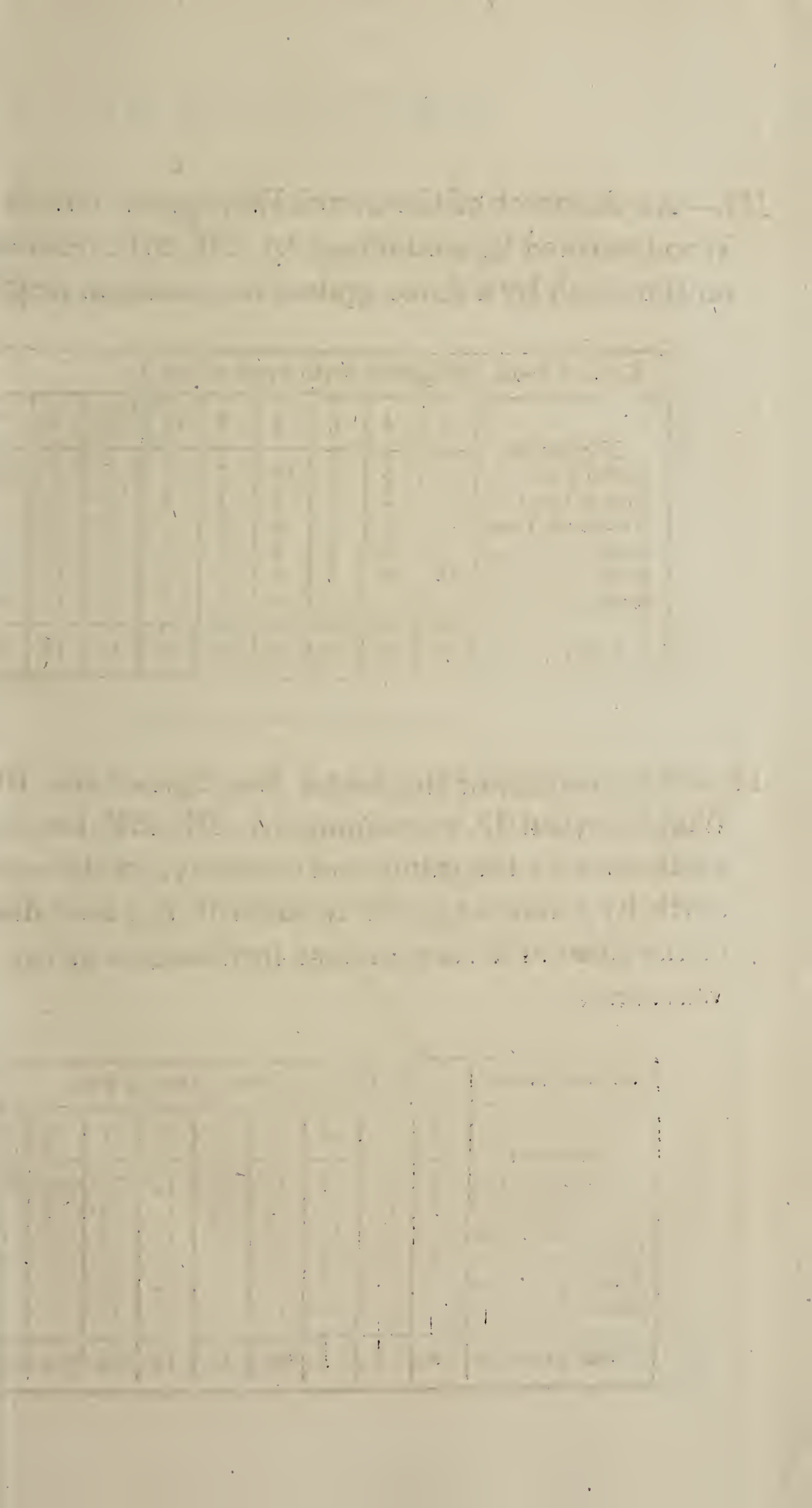
	Classes of Measured Trees.																	Total Number of Trees.
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Number of Scotch Firs.	2	9	16	21	23	19	32	27	23	12	13	9	8	4	3	3	3	227

* *Note.* I have drawn my Plan (which is preserved in the Society's collection, the annexed Plate being a diminished copy thereof), on a scale to match as near as may be, with the Plan which Mr. Moore delivered to the Society in 1779, and have given it a similar position for more ready comparison therewith. I have also described the pieces agreeable to his east point, which however inclines very considerably towards the south; but, from the vicinity of this Wood to that conspicuous and well-known object *Bowbrick-hill Church*, it may easily be found even by a stranger, without a guide.

II.—An Abstract of the *Scotch Firs*, *Spruce Firs*, *Weymouth Pines*, *Larch*, *Beech*, and *Birch* Trees, growing, in July 1794, in the division of Brown's Wood marked B, containing 3A. 3R. 27P. bounded on the south by a fence against the common heath of Aspley, on the south-west by the broad straight Riding leading to Bowbrick-hill Church, on the west by the fence against a plantation in Wavendon, and on the north-east and east in a curved line by the Riding, or cart-way, up the vale in Brown's Wood.

Kinds of Trees.	Heights of Small Trees in Feet.									Classes of Measured Trees.																				Number of Small Trees.	Number of measured Trees.	Total Number of Trees.
Number of	1	2	3	4	5	6	7	9	11	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
Scotch Firs	2	11	80	109	142	241	593	778	875	821	685	740	608	532	462	418	360	248	183	106	60	51	15	14	8	4	3	1	1	2831	5320	8151
Spruce Firs	2	..	3	1	2	..	2	1	2	1	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13	3	16
Weymouth Pines	..	..	..	..	1	2	3	2	3	4	..	1	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	11	7	18
Larch	2	..	3	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	....	6
Beech	..	1	2	4	4	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13	....	13
Birch	..	..	..	..	..	..	1	—	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	....	1
Totals	6	12	88	115	149	244	599	781	881	826	685	741	610	533	462	418	360	248	183	107	60	51	15	14	8	4	3	1	1	2875	5330	8205

III.—An



III.—An Abstract of the *Scotch Firs, Spruce Firs, Weymouth Pines, Larch, Beech,* and *Birch* Trees growing, in July 1794, in the division of Brown's Wood marked C, containing 0A. 2R. 25P. (exclusive of the morass or patch of unproductive bog containing twenty perches therein), bounded on the south by a fence against the common heath of Aspley, on the west by the riding or cart-way, and on the north-east by the foot-path.

Kinds of Trees.	Heights of Small Trees in Feet.						Classes of Measured Trees.																				Number of Small Trees.	Number of measured Trees.	Total Number of Trees.
Number of	4	5	6	7	9	11	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	26	27			
Scotch Firs	..	5	2	10	7	7	7	7	12	18	19	29	44	39	56	50	59	45	50	38	30	22	13	6	5	5	3	1	31	558	589
Spruce Firs	..	2	1	1	1	3	4	3	1	..	2	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	12	20
Weymouth Pines	..	..	..	4	6	2	5	5	..	6	2	1	3	2	3	3	3	..	..	2	1	..	..	..	..	..	..	..	12	36	48
Larch	..	3	1	1	..	..	1	1	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	4	9
Beech	16	19	5	4	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	46	....	46
Birch	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	....	2
Totals	16	29	9	20	17	13	17	16	13	24	23	32	48	42	59	53	62	45	50	40	31	22	13	6	5	5	3	1	104	610	714

IV.—An Abstract of the *Scotch Firs, Spruce Firs, Weymouth Pines, Larch, Beech,* and *Birch* Trees growing, in July 1794, in the division of Brown's Wood marked D, containing 3A. 2R. 33P. bounded on part of the south-west by a foot-path through Brown's Wood, on the remainder of the south-west by the riding and cart-way, on the west by the fence against a young plantation belonging to the Duke of Bedford, on part of the north by a fence against an ancient but now disused lane called *Hardwick-lane*, on part of the east and remainder of the north by the bottom of the fosse of a very ancient fortification or camp called *Dane's Borough*, and on the east by the fence against an ancient enclosure or wood in Wavendon.

Kinds of Trees.	Heights of Small Trees in Feet.									Classes of Measured Trees.																			Number of Small Trees.	Number of measured Trees.	Total Number of Trees.
Number of	1	2	3	4	5	6	7	9	11	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22	23	26			
Scotch Firs	1	..	3	18	45	12	173	230	373	478	537	708	786	748	757	596	447	309	176	86	69	30	25	15	7	3	1	1	855	5779	6634
Spruce Firs	3	..	..	3	4	..	4	4	9	4	1	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	27	8	35
Weymouth Pines	..	..	..	..	2	..	1	..	..	3	1	1	3	2	2	..	..	..	..	..	..	..	..	..	..	..	..	..	3	12	15
Larch	2	2	2	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9	....	9
Beech	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	....	3
Birch	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	....	1
Total	6	2	5	23	52	12	181	234	383	485	539	710	791	750	759	596	447	309	176	86	69	30	25	15	7	3	1	1	898	5799	6697

V.—An

It appeared from consulting my accounts of the sales of a great number of lots of thinnings, or poles, from similar plantations, that the average value of all the above measured-trees, was 12*d.* per foot in the year 1794; (and now, probably, the same are worth about 15*d.* per foot). I also considered the value of the tops and lop, or trimmings of the trees, as nearly equal to the labour of cutting them down for sale; and, estimating the small trees at one penny each, one with another; the general account stood as follows, viz.

14497	Scotch firs, measuring	6822	feet,		
27	Spruce do.	5	do.		
62	Pines, ...	28½	do.		
4	Larch, ...	1½	do.		
14590	measured trees, containing	6857	feet,		
	at 12*d.* are worth			£342	17 0
4137	small trees (from 1 to 11 feet high), at 1*d.* each, ...			17	4 9
18727	trees in all, ...			£360	1 9

From whence it appears that the total value of the trees in this plantation, in the year 1794, was about 360*l.*; that the average value of the whole number of trees was something above four-pence three farthings each, which is rather more than the value of each tree in the 9th class. If a mean tree, as to measure, be sought among all those which were measured as above, it will be found to fall between the 11th and 12th classes. If a mean tree be selected by regarding numbers only, that is, that there shall be as many measured trees larger than the mean, as there are smaller than it, this tree will be found in the 8th class.

Brown's Wood is situate, near the northern edge of a thick stratum of red sand (about 70 or 80 feet thick), resting upon a stratum of blue clay, or marl, which lies, I believe, but seven feet below the division C in the plan, and is the occasion of the springs and bog in the midst

V.—An Abstract of the *Scotch Firs*, *Spruce Firs*, *Weymouth Pines*, *Larch*, and *Beech* Trees growing, in July 1794, in the division of Brown's Wood marked E, containing 1A. 2R. 25P. being part of the ancient square fortification or camp called *Danes Borough*, bounded on the south-west and north-west by the bottom of the large fosse or ditch thereof; on the north by the above ancient lane which went through the site of the camp; and on the south-east, by a fence through a part of the site of the camp.

Kinds of Trees.	Heights of Small Trees in Feet.									Classes of Measured Trees.																Number of Small Trees.	Number of measured Trees.	Total Number of Trees.
	1	2	3	4	5	6	7	9	11	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Number of																												
Scotch Firs	..	..	3	..	1	3	36	57	112	182	237	308	350	355	381	286	218	129	70	48	23	13	6	3	4	212	2613	2825
Spruce Firs	1	1	3	15	7	1	2	1	6	2	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	37	4	41
Weymouth Pines	..	1	..	2	2	1	1	..	1	1	3	..	1	1	..	..	1	..	..	..	..	..	..	..	..	8	7	15
Larch	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	....	2
Beech	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	....	1
Total	1	2	6	17	12	6	39	58	119	185	241	309	351	356	381	286	219	129	70	48	23	13	6	3	4	260	2624	2884

A Summary of the Total Number of small Trees of different heights, and of larger Trees measured in different Classes, which were growing in Brown's Wood Plantation in Wavendon, in July 1794.

Divisions of the Wood as marked on the engraved Plan. Plate II.	Heights of Small Trees in Feet.									Classes of Measured Trees.																					Number of Small Trees.	Number of measured Trees.	Total Number of Trees.
	1	2	3	4	5	6	7	9	11	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	26	27			
A. R. P.																																		
A containing 0..0..21	..	..	..	..	..	..	..	..	..	2	9	16	21	23	19	32	27	23	12	13	9	8	4	3	3	3	..	..	..	..	..	....	227	227
B ..... 3..3..27	6	12	88	115	149	244	599	781	881	826	685	741	610	533	462	418	360	248	183	107	60	51	15	14	8	4	3	1	1	..	..	2875	5330	8205
C ..... 0..2..25	..	..	..	16	29	9	20	17	13	17	16	13	24	23	32	48	42	59	53	62	45	50	40	31	22	13	6	5	5	3	1	104	610	714
D ..... 3..2..33	6	2	5	23	52	12	181	234	383	485	539	710	791	750	759	596	447	309	176	86	69	30	25	15	7	3	..	1	..	1	..	898	5799	6697
E ..... 1..2..35	1	2	6	17	12	6	39	58	119	185	241	309	351	356	381	286	219	129	70	48	23	13	6	3	4	..	..	..	..	..	..	260	2624	2884
Total..10..0..21	13	16	99	171	242	271	839	1090	1396	1515	1490	1789	1797	1685	1653	1380	1095	768	494	316	206	152	90	66	44	23	9	7	6	4	1	4137	14590	18727

It

midst thereof; the north-west corner of D, and a considerable part of B, at its western end, are upon the top of this thick stratum of sand, which is in that part of it cemented into thin layers of sand-stone, by the oxydation of the large portion of iron which it contains, and is on that account very poor and barren. Descending from these two barren points, in all directions, towards the bog and the vales (one through the wood where the cart-way goes up, and the other on the south side of the wood), the land grows better in quality; not only as being more supplied with moisture, but because the sand, towards the middle and lower parts of this thick stratum, are much better adapted to vegetation than the upper parts of it. Previous to the new planting of this wood in 1778, it bore a straggling crop of oak and some other sorts of underwood, except the rocky parts, which were covered with heath only. It was

a very ancient enclosure, and never appears to have been pared by the poor for fuel, as the common heaths adjoining have been, and some of them now are.

Since the whole of the planted ground is 10A. 0R. 21P. and the *Acre*, *Rood*, and *Perch*, contain 43560, 10890, and 272.25 feet respectively, we have $10\times 43560+21\times 272.25=441317.25$ superficial feet, the contents thereof; which, divided by 18727, the total number of trees, gives 23.566 feet for the surface or space occupied by each tree. Now we may consider the whole ground as made up of 18727 little square plots, each containing 23.566 feet, and having a tree in the centre of each; and by extracting the square root of 23.566, we have 4.855, or about 4 feet $10\frac{1}{4}$ inches for the side of each square, or the mean distance of the trees from each other, supposing them equally distributed throughout the whole wood; but as this is not the case, I have given the

result

result of similar calculations on each separate division of the wood, and of the whole, including fences, rides, and bog, in the following table, and also added the result of a similar calculation upon the 19 acres and 51376 plants, which this wood was in 1778 stated to contain.

Divisions of the Wood, &c.	Contents thereof in Feet.	Number of Trees thereon.	Space in Feet occupied by each.	Mean Distance of the Trees		Number of Trees per Acre.
				In Feet and Decimals.	In Feet and Inches.	
					feet. inches	
A	5717.25	227	25.186	5.018	5 $0\frac{1}{4}$	1729.
B	170700.75	8205	20.804	4.561	4 $6\frac{1}{2}$	2094
C	28586.25	714	40.037	6.327	6 4	1088
D	161444.25	6697	24.106	4.910	4 11	1807
E	74868.75	2884	25.960	5.095	5 1	1678
Total on 10A. OR. 21P.	441317.25	18727	23.566	4.855	4 $10\frac{1}{4}$	1848
Total with Fences, &c. &c. 11A. OR. 13P.	482699.25	18727	25.775	5.077	5 1	1690
Mr. M's 19 Acres	827640.00	51376	16.109	4.014	4 $0\frac{1}{8}$	2704

In

In considering the last column of this table, it will appear that the division B has a much larger portion of plants per acre than the others have, occasioned by the stunted and dwarf state of the plants upon the rocky parts above mentioned: indeed, on about one-third part of this division, the plants had never been thinned or pruned; and it was with considerable difficulty, on account of the lateral branches, that we got in among them, to measure their heights: their general distance asunder was found to be four feet, and confirms this to have been the original distance of the plants in this wood, before the thinnings commenced, as in the last line of the above table, and the certificates delivered in 1778. And as 2722 is the number of plants on an acre, when set at four feet asunder, and 19A. 1R. 36P. or 456291 feet (including the rides and bog, which were both planted at first I believe), was the quantity planted; then

then say as 43560 (the feet in an acre), : 456291 :: 2722 : 28513, the number of trees at first planted by Mr. Moore. The superior soil and situation of the division C occasioned the thinning thereof to be earlier begun, and carried to a greater extent than in the other divisions, as the trees increased in size and height; which is the reason that this has the fewest plants per acre remaining. By referring back to the table containing the actual dimensions of 108 trees, it will be found that the trees in the higher classes are much more irregular in their contents than the smaller trees are: this arises from such trees as stood next the fence, and were not drawn up to so great a height, but spread more to branches than those within the wood, and from such trees as had accidentally lost their leader or top, both which had occasioned them to thicken more in the trunk, and consequently they were placed in a higher

class

class than their height and value justified; and this is a circumstance which future observers should particularly attend to, as also in applying these dimensions to perfect trees of the same girt at four feet high, within a plantation. Here the number of trees altogether in those classes was so small, that the error was of no material consequence. An inspection of the foregoing abstracts of the different divisions of this Wood, will shew the superior growth of Scotch firs on this sandy soil, above all the other sorts of trees, especially when a few plants of different sorts are, as in this case, introduced among a large number of Scotch firs: in a few years the latter overtop, and at length shade completely most other kinds of trees, and thus retard their growth, if not entirely destroy them: and there cannot, I think, remain a doubt, with practical men, but that plantations for profit, should

should each be of one kind of tree, except of deciduous trees, where some are intended for timber, and others for a permanent stub of underwood.

Mr. Robert Salmon succeeded me, on the death of the Duke of Bedford, in the management of this and others of his Grace's plantations and woods; and through his kindness I am enabled to state the number of trees which remained growing in the small division A of Brown's wood, at Christmas, 1804; and, in order to shew the comparative number of trees in each class, in 1794, and 1804, I have in the following table placed the particulars opposite each other.

A Com-

A Comparison of the Scotch firs growing in the division A of Brown's Wood, at two periods near ten years distant.

Class	No. of Trees in July 1794.	No. of Trees in Dec. 1804.
5	2	—
6	9	—
7	16	—
8	21	—
9	23	—
10	19	3
11	32	2
12	27	4
13	23	12
14	12	11
15	13	9
16	9	12
17	8	15
18	4	15
19	3	6
20	3	8
21	3	3
22	—	10
23	—	5
24	—	2
25	—	2
26	—	6
29	—	2
32	—	2
34	—	1
Totals	227	130

By this Table it appears, that the growth during the period mentioned, and the various thinnings which took place therein (and I lament that I am not able to give an account of the exact value of these thinnings), had left none remaining of the classes below the 10th, but had extended the classes from the 21st, which was the largest tree in 1794, to the 34th, the largest tree found among the 130 trees now remaining. By similar calculations to those in a foregoing Table, it will be found, that the mean distance of the trees in this division is now six feet seven inches and a half,

a half, and the number of trees per acre, 990, at twenty-six years from the time of planting.

I am not in possession of any exact accounts of the value of the thinnings from Brown's Wood, previous to, or even for two or three years after Mr. Moore sold the same to the Duke of Bedford; but it will not, I apprehend, be much wide of the truth, if we suppose the net produce of these thinnings, previous to the measurement in 1794, to have repaid the original expense of clearing the ground and planting, to have paid the composition in lieu of tithes, to which it is subject, and the parochial taxes, together with the charges of looking after and repairing the fences thereof, up to that time. And if we inquire, by help of the tables of annuities, or the rules of compound interest, what annuity or rent forborne sixteen years, allowing five per cent. interest, will amount to £360, we shall thus

thus find, that this plantation of 11A. 0R. 13P. paid to the proprietor during the sixteen years previous to 1794, an annual rent of £15. 4*s*. 4*d*. or at the rate of £1. 7*s*. 5*d*. per acre per annum, which must be considered as a very good rent for such land as this.—It was my intention to have given a rough calculation of the probable value of the trees now in Brown's Wood, founded on the supposition that the quality of the land in division A, as adapted to the growth of fir-trees, and their consequent size, number, and management, furnishes a fair average of the whole wood, as I believe it to do; but shall desist for the present, from having compared the actual measurement of six trees therein, in different classes, which Mr. Salmon lately sent me along with the number of trees; and finding their contents, particularly the larger ones, so much to exceed that of trees in the same classes among the 108 trees which I measured in 1794, owing

owing to the trees of my measuring being necessarily selected near the outside of the wood, there being then none in the interior parts large enough, and Mr. Salmon's trees of corresponding classes being selected from the inside of the wood; and shall conclude, with again calling the attention of future observers or calculators, when deducing or using a mean measurement for different classes of trees, to the above circumstances; and am, Sir,

Your obedient servant,

JOHN FAREY.

12, *Upper Crown-street, Westminster,*
May 1, 1805.

The

The SILVER MEDAL of the Society was this Session voted to Mr. WILLIAM SMITH, of Buckingham-Street, Adelphi, for IMPROVING BOGGY LAND by IRRIGATION. An Engraving is added to explain the manner of effecting it, and the following COMMUNICATIONS were received from him.

SIR,

HAVING paid very considerable attention to improvements of land by irrigation, and applied the water in a manner which I believe to be new and advantageous; I beg leave to submit my account thereof to the Society of Arts, &c. Upon this plan, the rushes and noxious plants are destroyed, the land is rendered firm, and grasses of good

good quality spring naturally. Even ferruginous waters will have a good effect thus used.

I am, Sir,

Your obedient servant,

WILLIAM SMITH.

Buckingham-Street, October 31st, 1804.

To CHARLES TAYLOR, Esq.

Mode of improving Boggy Land.

The whole surface of the boggy ground was pared with a breast-plough, and the peaty matter thrown together in ridges, like common high-ploughed land, with a ridge, like a head-ridge, at one end of each set of ridges. Each ridge has a cut or channel for water on the top, and a drain in the furrow or hollow between it and the next ridge. The head-ridge has a larger channel for water on its top, which supplies all the other ridges with water, and this main ridge is itself supplied by its connexion

with a larger channel or feeder, which first conveys the water out of the common brook-course into the meadow.

The furrow between each head-ridge and the ends of the beds has a larger drain, into which all the channels of drains in the furrows discharge their water, and which is by this main drain carried into the brook-course again. Thus the water is diverted out of its usual channel, only to float over the surface of the land, and run into that channel again lower down.

To get the water high enough to swim over the surface of any piece of ground, it is generally necessary to make a dam in the original channel, to pen up the water, till it rises to the surface, or near it, and convey it along a channel which shall have less fall than the brook, until it can be got out upon the surface. The length of such conduit or drain must therefore depend upon the fall in the lands which lie

parallel

parallel to the original channel of the water; and the quantity of land that can be covered with water, depends upon the distance between the proposed new channel and the old ones.

And, to perform this business in the most methodical manner, it is necessary to new model the surface, otherwise the water (which will always find its level) would lie too deep, or move too slowly over the low places in the ground, and thereby injure the grasses by a redundancy of water, while all the higher parts of the ground would appear like little islands above the surface of the water, and consequently receive no benefit from such an imperfect system of irrigation.

Where these inequalities of surface are large and numerous, it will be attended with much more expense to make such land into a regular form for floating, on account of the great expense of wheeling the earth from the

hills to the hollows. In these cases, it is necessary (in order to avoid expense) to adopt an irregular method of floating: by taking advantage of such irregularities of surface, a meadow may often be floated at a quarter of the expense required to put it into a regular form, and this method is found to answer the purpose very well, if the works are properly laid out with the spirit level. When the fall of water is ascertained, the form of the ground is the next thing to be attended to; if there are no natural declivities in the surface, down which the water may run from the overflowings of a cut on the summit into a drain in the hollows, so that the water may keep constantly running down such slopes by a regular current, which prevents a diminution on the ridges and a quick discharge in the lower drain; to avoid an accumulation in the furrows, it must be made with good slopes and plenty

of

of drains; these, with a constant supply of water in the winter, are the most essential parts of a water-meadow. The water must be constantly kept moving over the surface, and the practice proves, that where the water moves the quickest, there is always the most grass.

And, as the water must be constantly running off the land, it follows that it must be constantly running on, to keep every part of the surface properly supplied; and this requires a much greater quantity of water than is commonly imagined by those, who are wholly unacquainted with the practice of irrigation. In fact, every good water-meadow should be formed so that it may be said to be nothing but a wide extended channel for the water, no part of which should be too deep to prevent the points of the grass from appearing above its surface, consequently the water cannot be seen when the grass begins to grow. Yet it will still find its way between the shoots,

and nourish the grass without bearing it down, or excluding it from the benefit of the air and sun: this is a state, in which the grasses of a water-meadow increase very rapidly: in this state, no water can be seen in any part of a meadow, but in the cuts which bring it on and drains that take it off; the motion down the slopes is only perceptible where it runs off the upper cut and in the lower drain; in the still more perfect parts, when the grass has got a considerable shoot, even this part of its motion is not perceptible; and a well-regulated meadow, in the spring, cannot be known to be in a state of irrigation without walking into it. The water running among the shoots, soon becomes perceptible to the foot which proves that there is no inconsiderable quantity running down the slopes, though its motion upon that part cannot be seen.

It is therefore one of the fundamental principles of irrigation, to keep the water moving, and that in such well regulated quantities as shall neither be too great nor too little; for both of the extremes are alike unfriendly to vegetation; but I believe there is much more mischief done to a water-meadow by giving it too little, than too much water, and the greater the supply the less nicety is required in the adjustment, if the meadow is so laid out as to prevent its accumulation in any part thereof. But where the quantity of water is small, it is necessary to be very nice in the distribution of it, in order to receive the full benefit of the stream upon as much land as it is capable of floating.

Here again we must not run into extremes, and try to get the water over too much land at a time, and thereby prevent the grass from receiving the

full benefit of a quantity of water which is capable of giving it a good soaking: what that quantity is, will be best determined by practice, for some ground requires much more water than others.

In case of a short supply of water, which is extended to the improvement of as much land as it is capable of covering, according to the best principles of irrigation, it will be better to unite all the water upon such a portion of the work as practice shall prove it capable of covering well, and to let that part have the full benefit of the water as long at a time as is necessary to give a good soaking, or as long as it may be kept off the other parts without injury.

In some meadows, after they have had a complete soaking, which has saturated the soil, and the grass has thickened upon the surface, vegetation will not be retarded for some time for want of water, and those parts which

were

were forced the most in the autumn, will require the least in the spring. It will therefore be always advisable, on account of the water and a succession of grass, to get some part of the water-meadow as forward as possible in the autumn, that that part may be dried and fed the first in the spring, while all the water is employed in forcing on those other parts of the meadow which were neglected in the autumn.

By a prudent management of the water in uniting its vegetative powers upon those pieces of meadow which are disposed to produce the earliest vegetation in the spring, and so on in succession, from the earliest to the latest pieces of ground, or those which can be made so; a regular succession of grasses might be obtained, which would be much better than trying to get the whole alike, especially, if the quantity in one person's possession be very considerable, and his quantity of water

likely to fail or barely to suffice for the purpose.

This method of using the water in succession upon portions of the meadow, which practice shall prove it capable of covering at one time, will be applicable to most meadows; for there are few, that are well formed, that have too much water, especially in the winter, or where there are any mills or navigations; I have generally observed that the best meadows upon the large streams, are those which have the most water and the best falls.

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*Account of the nine acres of Water Meadow, on Prisley Farm near Fletwick, Westoning, and Tingrith in Bedfordshire.**

As the quantity of water is sometimes insufficient to float the whole of this meadow at once, it has been contrived

*A map of this meadow, but without any account of the method of forming it, may be seen in the Communications of the Board of Agriculture, Vol. IV. page 341.

to

to be divided into three parts, by means of two large hatches, within the meadow. Each of these principal divisions may again be divided into still smaller parts, by putting a common hatch or board made to the shape of either of the main feeders, which will stop the water out of any part, and force so much the more upon that which is intended to be floated. These contrivances are often necessary on account of the great scarcity of water, and also for the purpose of employing all the water upon any one part of the meadow, while the grass is feeding off the other; and (if the levels will admit of it) something like this ought to be done in every good water-meadow, for it is not merely the elevated or high-ridged form of the surface, which constitutes a good water-meadow, but such a disposition of the parts as is best calulated for the general purposes to which the land, the water, or its produce, may be most advan-

advantageously applied. The three parts of this meadow are upon two different levels, so that the drawing of either of the hatches before mentioned lays all the high part dry, and puts either the North or the South part of the lower level afloat at the same time. By keeping down one of those hatches and opening the other, all the water may be turned either upon the North or the South part of the low level, as occasion may require; or if both the hatches be shut down, the whole of the water may be used upon the high level, or two first sets of beds.

If there is more water than is sufficient to float either of the three parts separately, either of the two regulating hatches may be fixed at such a height as to use the remainder on the upper level; or the high level of the meadow may be made to receive its full quantity of water, and an opening be left under one or both of the hatches, so as to distribute

tribute the remainder of the water on either of the parts of the lower level, wherever it may be wanting; or the whole of the water may be used upon one of the lower levels, by adjusting the hatch so that that part shall have sufficient water, and drawing up the other high enough to discharge the surplus; or, if one part is floating, and neither of the other pieces are in want of water, any overplus may be turned down the waste ditch which divides the meadow from the upland, by drawing the outside or main hatch, high enough to discharge such surplus water under it.

The water is capable of all these variations, but there will seldom be any occasion for turning any water to waste, as it may generally be all employed upon the meadow or upon a third of it. If the other two parts should be in use, it will be found most advisable to feed only one part of such meadow at a time

time, as the other two-thirds might then be floating alternately.

When that third has been fed off, the most forward of the other two may then be laid dry for feeding, and the new-fed part floated in its stead. By this plan of feeding one-third at a time, and keeping the other two-thirds afloat at the same time, either together or separately, according to the quantity of water, the water will be always constantly employed from the first commencement of floating to the conclusion of the feeding and floating after it; when the whole may be shut up together for mowing.

The spring floating may be continued at intervals, (if the water be not foul) till the grass has gained a considerable height, but it must only be put on for a day or two at a time to cool the ground, and keep the grass growing. This management, if it be well conducted, will be of great service in forwarding the

the crop and increasing the bulk; the ground will also be the cooler and better for it when the crop comes off, consequently, it will occasion the after-grass to grow so much the quicker. No time should be lost in putting on the water immediately after the hay has been removed; or, as soon as one-third of the meadow can be cleared, the water should be immediately put upon that part till it is pretty well soaked, and then upon the other parts, in their turns, as soon as they are cleared. Great care should be taken both in feeding and taking off the hay, that it be done with a view of clearing that part first, where the water can be first applied to the purpose of producing another crop. The water should never run to waste but in the height of summer, when the grass may be high enough to form a thick cover to the ground, and keep it cool and moist enough for the purposes of vegetation without the aid of water; and

and also at the end of summer or autumn, when, if the meadows are fed with sheep, there may be some danger of rotting them by using the water at this time of the year. It will appear to those who are acquainted with the management of Wiltshire water-meadows (by the account annexed, which I received from his Grace the Duke of Bedford, and which states the quantity of grass cut and the time of feeding the meadow), that the grass was begun to be fed off before it was fit; and, from the long time that the sheep were kept upon the ground during the months of February, March, and April, there was much of the water wasted, which should have hourly been employed at that most prolifick season. Experience proves, that there is no danger of getting the grasses too strong upon the ground at this early season, and that crops which are six or seven inches high, and apparently too coarse and

high

high for a bullock to feed, are eaten with the most eagerness by sheep in the spring; and those parts where the grass is the thickest and most luxuriant are always fed the closest, and sought after with the greatest avidity. This being contrary to the common habits of all animals which graze upon dry pastures, where they give a decided preference to short and sweet herbage, may lead many persons to think that the grass of a water-meadow may be too high and luxuriant for sheep; but experience has proved, that such long grass is neither unfriendly nor unsavoury to them; and we know, that the grass always grows the fastest when it has gained considerable height and strength. It will also thicken at the bottom, and the roots will get much stronger hold in the ground, and consequently will not be subject to feel the want of water so soon during the time of feeding, and be able to make a much stronger shoot as soon

as it is shut up again, and the water restored to it. The greatest crop will also be of the best quality both in grass and hay, and will always be fed much closer and evener than in those places where the floating has been any ways deficient. The drowner, as he is generally called, or the man who has the superintendance of water-meadows, should therefore endeavour to make every part of the crop as uniform as possible; for no meadow can be said to be complete till that is accomplished, and a good eye may easily discover the management of a meadow by the crop upon the ground, whether it be in the spring, summer, or autumn: for, if the grass appear patchy, or of different sorts and colours, there can be no doubt but that the water has been partially applied. The different shades of the ground after close feeding and mowing, will also show the parts which have had

the

the most water, and where it has been deficient.

Workmen who have been accustomed to the mowing such crops, can also tell all those parts by the different cut of the grass. Much of the perfection of a water-meadow also depends upon the care and pride which the drowner takes, in doing his work well. It would therefore be very advisable not to change those men too often, but to keep the water-meadow constantly under the care of the same workman, so long as he manages it well; and no one should ever alter the water but him who has the constant care of attending it. Water-meadows will never be brought to perfection in any country, till the proprietors and managers of them shall take a pride in doing them well, and strive to rival each other in excellence. Land-owners and agricultural societies should therefore offer premiums for the greatest produce that can be obtained

from a given quantity of water-meadow; and a smaller premium to the drowner or managing man. This would excite emulation, and create a conversation and rival spirit of industry, and attention to a pursuit which many might not otherwise have thought about; as the crops of water-meadows are much more at the command of the farmer and less subject to blight, drought, or uncertainty of season, than any other crop which he cultivates; this would be a fair subject of competition in the skill of the managers, and the premium should not be determined by the produce of a single crop, but by the aggregate produce of the whole year, taken in spring-feed, hay, and autumn-feed.

Account

Account delivered to Mr. Smith, by order of his Grace the Duke of Bedford, of the produce of nine acres from Prisley Water-Meadow, made out of a Bog.

1803. *March 29th.* Stocked it with 12 score of sheep, kept them three weeks.

April 16th. Shut it up for hay.

June 23d. Cut the first crop of hay, supposed to be above two tons per acre.

August 20th. Cut the second crop, supposed to be one and a half ton per acre.

September 16th. Stocked it with four score of fat sheep, three weeks; after that it was pastured with lean bullocks, as long and as often as they could find food.

1804. *February 27th.* Stocked it with eight score and four lamb-hogs.

April 28th. They have now been nine weeks.—This is more than eighteen sheep to an acre for nine weeks.

It had more and better water this last winter than the winter before, but from our want of grass upon the farm, we have eaten it longer than we should have done.

June 21st. Began cutting the first crop of hay, which is a greater quantity than the year before, and a larger proportion of the best grasses.

N.B. At the Woburn sheep-shearing in June, 1805, the above meadow was examined by the Secretary of the Society, when the quantity of the grass upon it was not only found to be great, but the kinds of grass it produced in general, excellent in quality, and appearing, on comparison, to improve every year.

Reference to the annexed Plan of the six acres of Water-Meadow, on Prisley Farm.—Plate III.

1. The main hatch, which, when closed, occasions the water that is to irrigate the meadow, to flow into the feeder which fills the highest cuts, made upon

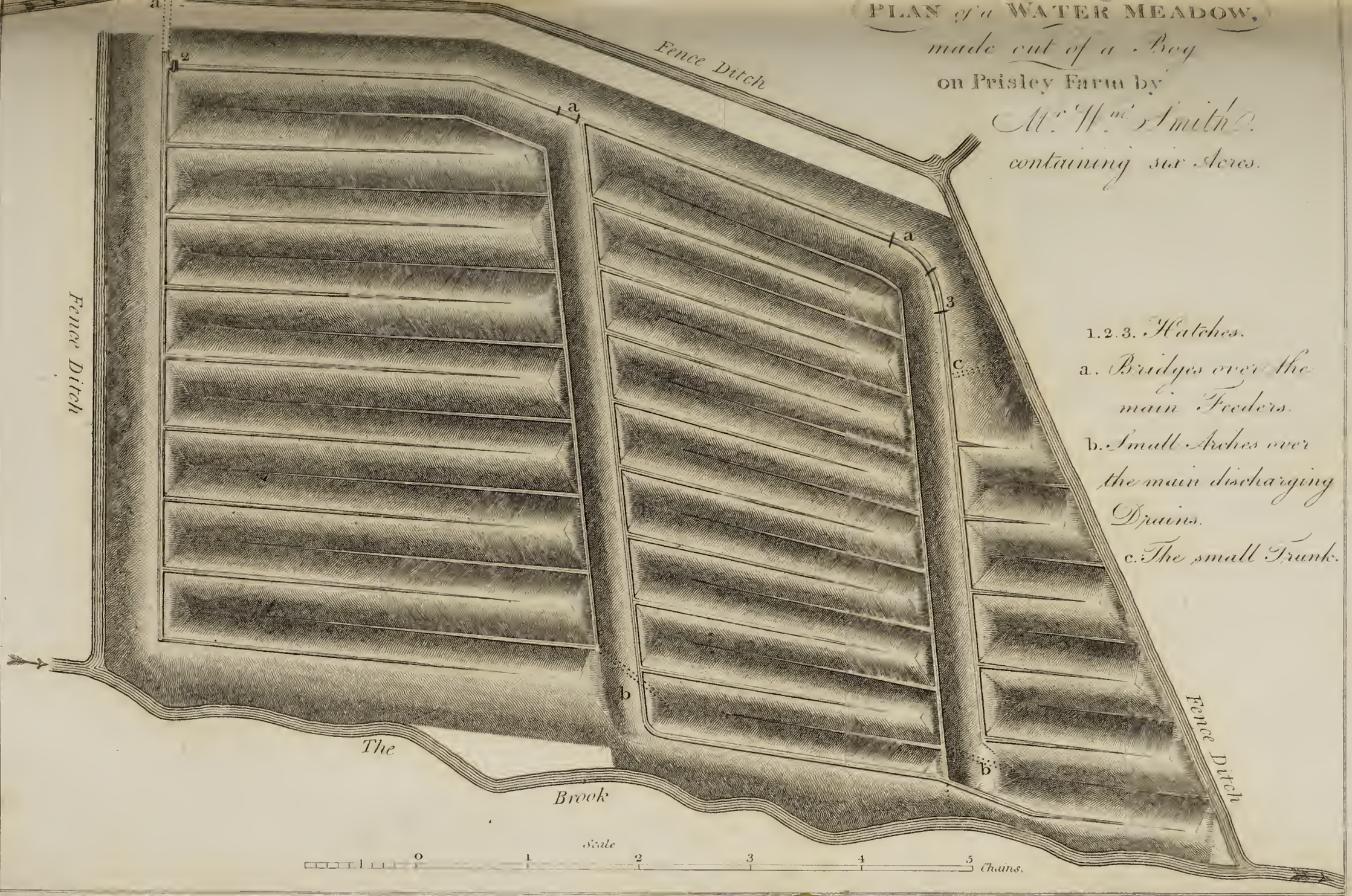
PLAN of a WATER MEADOW,

made out of a Bog

on Prisley Farm by

Mr. Wm. Smith.

containing six Acres.



upon the first eight ridges, from which cuts it gently glides down the slopes into the eight drains, which unite and discharge themselves under the arch at b.

2. The second hatch, which regulates the water for the ten ridges in the second division of the meadow.

3. The third hatch, which regulates the water for the five ridges in the third or lowest division of the meadow, from whence it falls into the old course of the brook.

CERTIFICATE.

I DO certify that Mr. William Smith, land-surveyor and drainer, from Bath, and now of Buckingham-street, London, was employed by the Duke of Bedford, to improve part of one of his farms, in the parish of Flitwick, in Bedfordshire, called Prisley Bog. That two pieces thereof, one containing about five, and the other about six acres, were in the year 1803 naked pieces of bog, (in the same state that

they were left, after Mr. Elkington's ineffectual attempt to drain them in the year 1795), and were wholly unproductive. That Mr. Smith planned, and entirely directed the improvement of these two pieces of land, by forming them into most complete water-meadows, a correct plan of one of which (viz. the six acres) is annexed. He has caused to be engraved also, the plan of another meadow on the same bog, containing nine acres, which he irrigated by direction of the late Duke of Bedford, in the year 1802. That these three meadows are done in the most complete manner, with many improvements, superior to any meadows which I have seen or read of; and the general improvement, both in the kind of herbage and quantity thereof, in the last summer and previous spring, were astonishingly great. Witness my hand,

JOHN FAREY.

12, *Upper Crown-street, Westminster,*
20th May, 1805.

To Mr. CHARLES TAYLOR.

The

The Sum of TEN POUNDS was this Session voted to Mr. WILLIAM WATSON, of North Middleton, near Wooler, Northumberland, for his comparative CULTURE of TURNIPS.

The following COMMUNICATIONS and CERTIFICATES were received from him: and it is recommended that such persons as wish for a fuller account upon the subject, will refer to his papers on the comparative CULTURE of TURNIPS, published in the 22d Volume of the Society's Transactions, to which the present statements form a proper Appendix.

SIR,

I HAVE seen a list of Premiums, &c. offered by the Society for this year. On several of the subjects, namely, the comparative culture of turnips, comparative culture of wheat, the cultivation

tion of spring wheat, the rotation of winter tares, turnips, and wheat, I shall probably be able to address the Society with confidence; as I am now conducting experiments with great accuracy.

This year I have no wheat after beans, but I have about ten acres after drilled peas, upon land not sufficiently good for beans. It is pretty well ascertained, that in favourable situations, with respect to climate and soil, wheat may be cultivated with great advantage after drilled and well-hoed beans; but in late springs the land cannot be sufficiently pulverized and cleansed for beans, so as to afford a prospect of getting them off the ground before the middle of November; and in such cases, and in almost all seasons, upon inferior soils, it seems of consequence to encourage the culture of drilled peas, which may be sown from the 1st to the 25th of April, and which will ripen in September, or early in October. I am therefore trying that management with

accuracy.

accuracy.—I make these experiments for my own satisfaction and instruction, in the first instance, and with a view of communicating the results to the world as soon as I can speak with confidence.

My turnip experiment is this year made with the dung in a perfectly good state, and in quantity about twenty-eight loads per acre, or double that used last year. It is also varied in the mode of sowing with the narrow intervals. I cannot conceive a more advantageous system in certain situations, and to a moderate extent, than that of winter-tares, turnips, and wheat. I have tried it in two seasons.—This year I cut four acres of tares, and sowed the land, in a well-pulverized and perfectly clean state, with turnips within the month of June.

I am, very truly, with great respect,

SIR,

Your most obedient humble servant,

W. WATSON.

North Middleton, July 17th, 1804.

TO CHARLES TAYLOR, ESQ.

SIR,

SIR,

I HAVE to request that you will do me the honour of laying before the proper meeting, the following account of an experiment on the comparative culture of turnips.

In June last, I prepared about ten acres of light gravelly land for turnips, in the usual manner.—The whole of this ground produced turnips in 1802, and spring-wheat in 1803, and was much alike in all parts in quality and condition. About four acres of it were sown in the broadcast-mode, and nearly the whole of the other part in drills upon one-bout ridges, with intervals of twenty-six inches. In January last, I weighed the turnips produced upon a part of these ten acres, making choice of two pieces of ground in different sides of the field, where the drilled and broadcast turnips were contiguous *in each piece*, where the ground

was

was alike in quality, and where equal attention had been bestowed in hoeing. In one trial, the weight of the drilled was to that of the broadcast turnips, as five is to three, and in the other as six to five. This variation in the ratio of the weight I imputed partly to a difference in the time of sowing, a few days having been suffered to elapse, in order that that operation might be performed when the soil, under each mode of culture, was in a similar state with respect to moisture, and partly to a small difference in the quality of the dung, the only manure applied; for, though it was almost totally the produce of one fold yard, yet, as a small quantity of stable-dung was carried from another, and mixed with it to promote a speedy fermentation, it is probable that some parts of the dung-hill might be more fertilizing than others. Having anticipated what might reasonably be advanced on this ground, against the

accuracy

accuracy of my experiment, I carried sixty loads of dung from one straw-yard to the field, in the latter end of April last, and mixed it completely; and as the whole of this manure was raised among lean cattle, which were fed with straw only, it was an homogeneous mass. Towards the end of May, it was pretty well fermented, and as rotten as that used in general practice.—On the 6th of June, I examined it again, and being satisfied that it was singularly fit for the purposes of experiments, I marked out a piece of ground near it (containing about three thousand and twenty-three square yards) which I had very minutely examined, and which was throughout precisely similar in quality and condition. This piece of ground (the quality of which was below mediocrity) had been prepared in the same manner as the above ten acres, of which it was a part. I divided it into three ridges, and on the afternoon of the above

above day, sowed it with the same kind of turnip-seed, without the smallest variation of weather. One of these parts was sown in drills on one-bout ridges, with intervals of twenty-six inches; another on the broad-cast mode; and the third in drills upon a flat surface, with intervals of thirteen inches.—In the latter, the seed was deposited immediately after the furrow was turned by a drill-machine fastened to the plough, and as it was well covered in the rut made by the coulter of the machine, this ridge was not harrowed afterwards; the dung, therefore, was as well covered as it could be in this mode of cultivation.

In order that the manure applied to each of these ridges might be equally moist *on every part of them*—I did not use any—not the smallest particle—but what was taken from the inner part of the dunghill. Each ridge was manured at the rate of twenty-seven two-

horse

horse cart-loads per acre precisely. In this, as well as in every other operation, the greatest accuracy was observed; the same person hoed every part of these ridges, peforming that work on each, in the same kind of weather, and leaving the plants, in each mode of culture, about a foot asunder; which distance, however, it is scarcely necessary to observe, applies to the rows only of the drilled turnips.

For the accounts of hoeing, and other particulars relative to the management pursued in each mode of cultivation, I beg leave to refer to my letter to you, published in the 22d Volume of the Society's Transactions, page 92.

Several showers of rain within a fortnight after the seed was committed to the ground, promoted the vigorous growth of abundance of plants on each ridge; but as the soil is light and gravelly, this favourable appearance was considerably altered by the succeeding

ceeding drought in July. The plants revived, however, after the rains in August, and proved a full crop on all parts of the land.

All the turnips produced upon one half of each ridge, were exactly weighed on the 29th of January, after the tops and tap roots were cut off, and on the 13th of last month the whole of the remaining turnips were weighed with equal accuracy. The number of square yards in each ridge was ascertained with the utmost precision.

	tons.	cwt.	st.	lbs.	
The turnips on the ridge with broad intervals weighed at the rate of	16	10	4	6	per acre.
Those on the ridge with narrow intervals, at the rate of	11	19	3	11	ditto.
And those on the ridge sown in the broadcast mode, at the rate of	12	8	1	13	ditto.

On adjoining land, superior to that upon which the above experiment was made, but considerably below the first-

rate quality, I last season obtained, in the Northumberland mode of drilling (on one-bout ridges with intervals of twenty-six inches), thirty-four tons of turnips, *after about fifteen two-horse cart-loads of dung* per acre.

The above experiment having been conducted on a sufficiently large scale, I beg leave to become a candidate for the Society's premium,

And am, Sir,

Your most obedient humble servant,

W. WATSON.

North Middleton, near Wooler, Northumberland, March 1st, 1805.

To Mr. CHARLES TAYLOR.

Certificates from Adam Rutherford, son of John Rutherford, farmer, at Lookout, by Berwick-upon-Tweed; and J. Bartrim, husbandman, of North Middleton, confirmed the above statement and the accuracy of Mr. Watson's experiments.

The

The GOLD MEDAL or THIRTY GUINEAS, at the option of the Candidate, was this session adjudged to Mr. SETH BULL, of Ely, for PLANTING OSIERS.

The following ACCOUNTS and CERTIFICATES were received from him, and the Pecuniary Reward paid to him, at his desire.

An Account of other Plantations of Osiers, for which Mr. BULL was rewarded, may be seen in the 20th Volume of the Society's Transactions.

SIR,

THE plantation of osiers, for which I received a premium in the year 1802, grew so luxuriantly, as to convince me that the nature of the soil was peculiarly favourable to them, I was induced to make a further experiment of a piece of unembanked fen land,

very near the former, containing upwards of seven acres, which I planted in the spring of this year, and beg leave to offer myself a candidate for the premium given by the Society for the Encouragement of Arts, &c. for the planting of osiers. Perhaps it will not be deemed unnecessary for me to state, that in the summer of 1803, I prepared the land by throwing it up into beds, each four yards wide, and raised them full eighteen inches higher than the natural soil. The land being remarkably low, and covered for the greater part of the year with water, rendered such a step, though very expensive, absolutely necessary previous to planting. I planted about fourteen thousand cuttings, or sets per statute acre, and indeed pursued the same steps, which I had so successfully adopted in my former plantation. The plants, consisting of what are called French, new-kind, and osiers, were all of my own growing, and

of

of the best quality. That they thrive very well, that I have kept them well, and perfectly free from weeds, the Rev. Mr. Mules, and Mr. Lutt, jun. both of Ely, will certify; and I can with truth assert, that though the annual rent of the land per acre could not be estimated at more than five shillings for feeding with cattle, by reason of the short time in the summer it was usually dry; yet, now that I have been at the expense of planting it, the labour necessary only to prepare the rods for the basket-makers use, amounts to upwards of five pounds per acre, per annum.

I remain, Sir,

Your much obliged,

And very humble servant,

SETH BULL.

Ely, 12*th November*, 1804.

CHARLES TAYLOR, Esq.

CERTIFICATE.

I, EDWARD LUTT, measured the land planted by Captain Bull in April last, and found it to contain 7A. 1R. 29P. EDWARD LUTT, jun.

And we have often seen the plantations, and assert that they are exactly in the state as above described by him. CHARLES MULES.
EDWARD LUTT, jun.

SIR,

IN reply to your letter of the 10th instant, I shall insert, for the information of the Society of Arts, &c. the whole of the expense of preparing the land, sets, planting, weeding, &c. of a statute acre of osiers, and also add the amount of the annual value of an acre, which I planted in 1801, and I have a very fair prospect that my last plantation will prove equally productive in future.

Expense

Expense of planting a statute acre of Osiers.

	£.	s.	d.
Throwing up the land into beds, or bars, by trenches or ditches, and raising the soil full eighteen inches higher than it is in its natural state (vide my letter of 12th of November last), 160 poles, at 1s. 6d. each,	12	0	0
Fourteen thousand sets, at £1 per thousand,	14	0	0
Planting ditto, at 3s. per ditto,	2	2	0
Weeding twice in the course of the summer with hoes, or reaping-hooks, generally with the latter, and performed usually by women and children,	0	16	0
Total Expense	£28	18	0

Annual value of an acre of Osiers, upon an average of the whole quantity, which I planted in 1801.

DR.

	£.	s.	d.
To rent, of the land I value at 10s. though never let at more than 6s. for feeding cattle,	0	10	0
Weeding twice,	0	16	0
Fencing and parochial dues,	0	10	0
Cutting the rods, at 3s. per score bunches of forty-five inches in circumference, each eight score,	1	4	0

	£.	s.	d.
Interest of the money for the expense of planting,	1	9	0
Filling up the plants which die annually, ...	0	6	0
Dr.	£4	15	0

Cr.

By 160 bunches of green rods, which I have sold upon an average of three years, at 1s. 4d: each (†unpeeled), ...	10	13	4
Dr.	4	15	0
Net profit per acre ..	£5	18	4

† N. B When they are peeled, which is almost always the case, the labour is at least £4 per acre in addition to the above, and will pay very well for the trouble and expense attending it, and that is performed also by women and children principally.

Thus, Sir, by the above statement, which I pledge myself to be correct, it will appear to the committee, that an acre of land, whose utmost value to the *occupier*, could not be estimated even at £1. 10*s*. per annum, and to the owner not more than 10*s*. is rendered, by planting osiers, capable of giving employment to numbers of the poor, whose labour only amounts to six guineas per acre,

acre, for preparing the rods for the basket-makers use; and also, yielding nearly an equal sum to the planter, to remunerate him for his trouble, &c. of attending to the business.

I must also beg farther to state, that I planted my osiers between the latter end of February and the beginning of April last, and I hope to be allowed to take credit to myself for the superior degree of order I keep my plantations in. I have also planted round them nearly one thousand willow-trees.

I beg also, Sir, to return you thanks for your polite attention to every part of my former letter,

And remain your much obliged,

And very humble servant,

SETH BULL.

Ely, January 13th, 1805.

To CHARLES TAYLOR, Esq.

The

The above account is confirmed by a subsequent letter from the Rev. Charles Mules, who added, that Mr. Bull's plantation of osiers is by far the best that he has seen in the isle of Ely, and that he is inclined to believe Mr. Bull will clear twenty per cent by his purchases.

PAPERS

IN

CHEMISTRY.

CHEMISTRY.

The SILVER MEDAL and TWENTY GUINEAS were this Session voted to Mr. THOMAS VANHERMAN, at No. 21, Mary-le-bone-street, Golden-square, for his Processes of Cheap and Durable PAINTS with FISH-OIL.

The following ACCOUNTS and CERTIFICATE were received from him.

GENTLEMEN,

HAVING applied a great portion of my time, for several years past, to discover a method of preparing a cheap and durable composition for the defence and preservation of all work exposed to the inclemency of the weather, I have now the satisfaction of laying before the Society for the Encouragement

of Arts, &c. specimens of some of the above colours ready prepared for use, which will, I flatter myself, be found superior to all others, for cheapness and durability, equal to any in beauty, and not subject to blister or peel off by the sun.

The vehicle made use of for the said paints is fish-oil, the preparation of which is so simple, that when known, gentlemen who have large concerns to paint, may have this composition of any colour manufactured, and laid on by their labourers. I have sent a bottle of the prepared oil; also, a number of patterns, of various colours. The highest price of any, does not exceed three-pence per pound, and many of them so low as two-pence, in a state fit for use. I have likewise sent a pot of white-lead which has been ground with prepared fish-oil, and which, when thinned with linseed-oil, surpasses any white hitherto made use of for resisting all weathers, and retaining

taining its whiteness. I hope my humble endeavours will merit the approbation of the Society, before whom, I will, at any time they shall please to appoint, make the various experiments they may require.

Relying on your encouragement, I am, Gentlemen, with due respect,

Your most obedient humble servant,

THOMAS VANHERMAN.

No. 2, Bedford Place, Rotherhithe,
December 11th, 1804.

To the SOCIETY of ARTS, &c.

To refine one ton of Cod, Whale, or Seal Oil, for painting, with the cost attending it.

	£.	s.	d.
One ton of fish-oil, or 252 gallons, ...	36	0	0
32 gallons of vinegar, at 2s. per gallon, ...	3	4	0
12lbs. litharge, at 5d. per lb.	0	5	0
12lbs. white copperas, at 6d. ditto, ...	0	6	0
12 gallons of linseed-oil, at 4s. 6d. per gallon,	2	14	0
2 gallons of spirit of turpentine, at 8s. ditto,	0	16	0
	£43	5	0

252 gallons

252 gallons of fish-oil,
12 ditto linseed-oil,
2 ditto spirits of turpentine,
32 ditto vinegar

298 gallons, worth 4s. 6d. per gallon.

Which produces ..	£67	1	0
Deduct the expense ..	43	5	0
	£23	16	0 profit.

To prepare the Vinegar for the Oil.

Into a cask which will contain about forty gallons, put thirty-two gallons of good common vinegar; add to this twelve pounds of litharge, and twelve pounds of white copperas in powder; bung up the vessel, and shake and roll it well twice a day for a week; when it will be fit to put into a ton of whale, cod, or seal oil; (but the Southern whale oil is to be preferred, on account of its good colour, and little or no smell) shake and mix all together, when it may settle until the next day; then pour off the clear, which will be about seven-eighths

eighths of the whole. To this clear part add twelve gallons of linseed-oil, and two gallons of spirits of turpentine; shake them well together, and after the whole has settled two or three days, it will be fit to grind white lead, and all fine colours in; and, when ground, cannot be distinguished from those ground in linseed-oil, unless by the superiority of its colour.

If the oil is wanted only for coarse purposes, the linseed-oil and oil of turpentine may be added at the same time that the prepared vinegar is put in, and, after being well shaken up, is fit for immediate use without being suffered to settle.

The vinegar is to dissolve the litharge, and the copperas accelerates the dissolution, and strengthens the drying quality.

The residue, or bottom, when settled, by the addition of half its quantity of fresh lime-water, forms an excellent

oil for mixing with all the coarse paints for preserving outside work.

Note. All colours ground in the above oil, and used for inside work, must be thinned with linseed-oil and oil of turpentine.

☞ The oil mixed with lime-water, I call *incorporated oil.*

The method of preparing and the expense of the various Impenetrable Paints.

First.—*Subdued Green.*

	£.	s.	d.
Fresh lime-water, 6 gallons	0	0	3
Road dirt finely sifted, 112 pounds, ...	0	1	0
Whiting, 112 ditto, ...	0	2	4
Blue-black, 30 ditto, ...	0	2	6
Wet blue, 20 ditto, ...	0	10	0
Residue of the oil, 3 gallons, ...	0	6	0
Yellow ochre in powder, 24 pounds, ...	0	2	0
	£1	4	1

This composition will weigh 368 pounds, which is scarce one penny per pound. To render the above paint fit for

for use, to every eight pounds add one quart of the incorporated oil, and one quart of linseed-oil, and it will be found a paint with every requisite quality, both of beauty, durability, and cheapness, and in this state of preparation does not exceed two-pence-halfpenny per pound; whereas the coal tar of the same colour is six-pence.

The method of mixing the ingredients for the Subdued Green.

First, pour six gallons of lime-water into a large tub, then throw in 112 pounds of whiting; stir it round well with a stirrer, let it settle for about an hour, and stir it again. Now you may put in the 112 pounds of road dirt, mix it well, then add the blue-black, after which the yellow-ochre, and when all is tolerably blended, take it out of the tub and put it on a large board or platform, and with a labourer's shovel mix,

and work it about as they do mortar. Now add the wet blue, which must be previously ground in the incorporated oil (as it will not grind or mix with any other oil). When this is added to the mass, you may begin to thin it with the incorporated oil in the proportion of one quart to every eight pounds, and then the linseed-oil in the same proportion, and it is ready to be put into casks for use.

Lead Colour.

	£.	s.	d.
Whiting, 112 pounds, ...	0	2	4
Blue-black, 5 ditto, ...	0	1	8
Lead ground in oil, 28 ditto, ...	0	14	0
Road dirt, 56 ditto, ...	0	0	6
Lime-water, 5 gallons, ...	0	0	6
Residue of the oil, 2½ ditto, ...	0	5	0
	£1	4	0

Weighs 256 pounds.

To the above add two gallons of the incorporated oil, and two gallons of linseed-oil to thin it for use, and it will not exceed 1¾*d.* per pound.

Note.—

Note.—The lime-water, whiting, road dirt, and blue-black, must be first mixed together, then add the ground lead, first blending it with two gallons and a half of the prepared fish-oil, after which thin the whole with the two gallons of linseed-oil, and two gallons of incorporated oil, and it will be fit for use. For garden doors, and other work liable to be in constant use, a little spirits of turpentine may be added to the paint whilst laying on, which will have the desired effect.

Bright Green.

		£.	s.	d.
112	pounds yellow ochre in powder, at 2d. per lb.	0	18	8
168	ditto road dust,	0	1	8
112	ditto wet blue, at 6d. per lb.	2	16	0
10	ditto blue-black, at 3d. ditto,	0	2	6
6	gallons of lime water,	0	0	6
4	ditto fish-oil prepared,	0	12	0
7½	ditto incorporated oil,	0	15	0
7½	ditto linseed-oil, at 4s. 6d. per gallon,	2	8	9
592lbs.	weight.	£7	15	1

This excellent bright green does not exceed three-pence farthing per pound ready to lay on, and the inventor challenges any colour-man or painter, to produce a green equal to it for eighteen-pence.

After painting, the colour left in the pot may be covered with water to prevent it from skinning, and the brushes, as usual, should be cleaned with the painting knife, and kept under water.

A brighter green may be formed by omitting the blue-black; and

A lighter green may be made by the addition of ten pounds of ground white-lead.

A variety of greens may be obtained, by varying the proportions of the blue and yellow.

Observe that the wet blue must be ground with the incorporated oil, preparatory to its being mixed with the mass.

Stone Colour.

	£.	s.	d.
Lime-water, 4 gallons,	0	0	4
Whiting, 112 pounds,	0	2	4
White lead ground, 28 pounds, at 6d. per lb.	0	14	0
Road dust, 56 pounds,	0	0	6
Prepared fish-oil, 2 gallons,	0	6	0
Incorporated oil, 3½ gallons,	0	7	0
Linseed-oil, 3½ ditto,	0	15	9
Weighs 293lbs.	£2	5	11

The above stone colour, fit for use, is not two-pence per pound.

Brown Red.

	£.	s.	d.
Lime-water, 8 gallons,	0	0	8
Spanish brown, 112lbs.	1	0	0
Road dust, 224lbs.	0	2	0
4 gallons of fish-oil,	0	12	0
4 ditto incorporated oil,	0	8	0
4 ditto linseed-oil,	0	18	0
Weighs 501lbs.	£2	0	8

This most excellent paint is scarcely one penny per pound.

The Spanish brown must be in powder.

A good chocolate colour is made by the addition of blue-black in powder or lamp-black, till the colour is to your mind, and a lighter brown may be formed by adding ground white-lead.

Note.—By ground lead, is meant white-lead ground in oil.

Yellow is prepared with yellow ochre in powder, in the same proportion as the Spanish brown.

Black is also prepared in the same proportion, using lamp-black or blue-black.

To whiten Linseed-Oil.

Take any quantity of linseed-oil, and to every gallon add two ounces of litharge; shake it up every day for fourteen days, then let it settle a day or two; pour off the clear into shallow pans, the same as dripping-pans, first putting half a pint of spirits of turpentine

tine to each gallon. Place it in the sun, and in three days it will be as white as nut-oil.

This oil, before it is bleached, and without the turpentine, is far superior to the best boiled oil, there being no waste or offensive smell.

THOMAS VANHERMAN.

From experiments made, it appears that fine sand will not answer the purposes of road dirt in painting, and that this dry dirt or dust collected in highways much travelled by horses and carriages, and afterwards finely sifted, is the article recommended, as possessing the properties required.

SIR,

ENCLOSED you will find a letter from Mr. Hill, West Lavant, Sussex, builder, and surveyor to his Grace the Duke of Richmond, with his opinion respecting the painting of his Grace's house and premises, at Earl's Court, Little Chelsea; which was finished December,

December, 1803, which I request you will present to the Society's Committee for their inspection.

I am, Sir,

Your respectful humble servant,

THOMAS VANHERMAN.

No. 2, Bedford-Place, Rotherhithe,
February 11th, 1805.

CHARLES TAYLOR, Esq.

SIR,

I HAVE just received your letter dated the 5th instant, and am happy to find that your oil and colour business so well stands the test of others, as well as that of myself. The fish-oil composition you made use of, in all the painting you have done at Earl's Court, Kensington, for his Grace the Duke of Richmond, under my superintendance, in 1802-3, was fully equal, if not superior to any painting done in the usual way with linseed-oil, white-lead, &c.

&c. I have also the highest opinion of your coarse composition and fish-oil you made use of on the out-buildings, fences, &c. on the above premises; the great body and hard surface it holds out, must be of the greatest preservation to all timbers and fences, exposed to open air, and all weathers. It must also be of the greatest service on plastere stucco, external walls, &c.

If any farther attestation from me, relative to the business you did at the above premises, can be of any service to you, you will command,

Sir, your obedient servant,

W. Hill.

West Lavant, near Chichester, Sussex,
February 7th, 1805.

Mr. Thomas Vanherman.

SIR,

YOUR favour announcing to me the reward voted by the Society of Arts, &c. gave me inexpressible satisfaction,

faction, and I trust my future efforts to merit their approbation will be found worthy their further notice.

I am, Sir, with the greatest respect,

Your humble servant,

THOMAS VANHERMAN.

P. S. I beg leave here to subjoin a receipt for a constant white for the inside painting of houses; which paint, though not divested of smell in the operation, will become dry in four hours, and all smell gone in that time.

White Paint.

To one gallon of spirits of turpentine, add two pounds of frankincense, let it simmer over a clear fire until dissolved; strain it and bottle it for use. To one gallon of my bleached linseed-oil, add one quart of the above, shake them well together and bottle it also. Let any quantity of white-lead be ground with spirits of turpentine very fine, then add a suf-

a sufficient portion of the last mixture to it, until you find it fit for laying on. If in working it grows thick, it must be thinned with spirits of turpentine.—It is a flat or dead white.

No. 21, Mary-le-bone Street, Golden-Square,
April 9th, 1805.

CHARLES TAYLOR, Esq.

TWENTY

TWENTY GUINEAS were this Session adjudged to Mrs. JANE RICHARDSON, of No. 3, Willis's-Place, Chelsea, for clearing FEATHERS from their animal OIL, being Class 90, of the Premiums offered by the Society.

The following ACCOUNTS were received from her.

SIR,

I HAVE sent forty pounds weight of feathers, cleared from their animal oil, in claim of the premium offered by the Society, and am, Sir,

Your obedient servant,

JANE RICHARDSON.

No. 1, *York-place, Lambeth.*
Jan. 16, 1805.

CHARLES TAYLOR, Esq.

DE-

DESCRIPTION *of the process for clearing* FEATHERS *from their animal* OIL.

Take for every gallon of clean water, one pound of quick-lime; mix them well together, and when the undissolved lime is precipitated in fine powder, pour off the clear lime-water for use, at the time it is wanted.

Put the feathers to be cleaned in another tub, and add to them a quantity of the clear lime-water, sufficient to cover the feathers about three inches, when well immersed and stirred about therein.

The feathers, when thoroughly moistened, will sink down and should remain in the lime-water three or four days, after which the foul liquor should be separated from the feathers by laying them on a sieve.

The feathers should be afterwards well washed in clean water and dried upon nets;

nets; the meshes about the fineness of cabbage-nets.

The feathers must from time to time be shaken upon the nets, and as they dry will fall through the meshes, and are to be collected for use.

The admission of air will be serviceable in the drying; the whole process will be completed in about three weeks; after being prepared as above mentioned, they will only require beating for use.

Mr. Jolly, poulterer, of Charing-cross, attended a committee appointed to inspect the feathers, and stated that Mrs. Richardson had bought from him forty pounds weight of feathers, in the state they were plucked from dead geese, and in such a condition that if they had been kept in the bag only four days, without being cleansed, they would have been very offensive; that the

the feathers exhibited by Mrs. Richardson appear to be the same he had sold her, but that they were now in a much cleaner state, and seem perfectly cleared from their animal oil.

The Committee, in order to authenticate more fully the merits of Mrs. Richardson's process, requested Mr. Grant, a considerable dealer in feathers, to furnish some specimens of feathers of different kinds in an unclean state, to be cleansed by Mrs. Richardson; in consequence whereof an application was made to Mr. Grant, and the following letter received from him.

SIR,

I TAKE the liberty of sending herewith three samples of feathers, on which the experiments may be tried; but should the quantity not be sufficient,

on being favoured with your commands, shall with pleasure send any quantity necessary.

The bag No. 1, contains the commonest feathers we ever make use of; it is a Russian produce of various wild-fowl; No. 2, grey Dantzick goose; No. 3, a superior kind of Dantzick goose.

The two first are in their raw state, just taken out of the bags in which they were imported; the last have been stoved the usual time (three days), but retain their unpleasant smell. Should it not be considered giving you too much trouble, shall be extremely obliged by your favouring me with a line when the experiment has been made, and I shall be happy in waiting upon you to know the result.

I am respectfully, Sir,
Your obedient humble servant,
THOMAS GRANT.

No. 226, Piccadilly.

CHARLES TAYLOR, Esq.

After

After the feathers last mentioned were sent back by Mrs. Richardson, Mr. Grant attended to examine them, and declared that they appeared to be perfectly well cleaned.

Certificates from Mr. Christopher Bushnan, No. 10, Beaufort-row, Chelsea, and from Mr. W. Baily, testified to the efficacy of Mrs. Richardson's process.

FIFTEEN GUINEAS were this Session voted to Mrs ANNE MORRIS, No. 41, Union-street, near the Middlesex Hospital, for a method of cleansing SILK, WOOLLEN, and COTTON Goods, without damage to the Texture or Colour.

The following ACCOUNTS were received by the Society.

SIR,

I BEG the Society's inspection of a method I have invented for cleaning silk, cotton, and woollen goods, which I think will be found very efficacious, and am with respect, Sir,

Your humble servant,
ANNE MORRIS.

Union-street, Jan. 23, 1805.

CHARLES TAYLOR, Esq.

Description

Description of Mrs. Morris's Method.

Take raw potatoes, in the state they are taken out of the earth, wash them well, then rub them on a grater over a vessel of clean water to a fine pulp, pass the liquid matter through a coarse sieve into another tub of clear water; let the mixture stand till the fine white particles of the potatoes are precipitated, then pour the mucilaginous liquor from the fecula, and preserve this liquor for use. The article to be cleaned should then be laid upon a linen cloth on a table, and having provided a clean sponge, dip the sponge in the potato-liquor, and apply the sponge thus wet upon the article to be cleaned, and rub it well upon it with repeated portions of the potato-liquor, till the dirt is perfectly separated; then wash the article in clean water several times,

to remove the loose dirt; it may afterwards be smoothed or dried.

Two middle-sized potatoes will be sufficient for a pint of water.

The white fecula which separates in making the mucilaginous liquor, will answer the purpose of tapioca, will make an useful nourishing food with soup or milk, or serve to make starch and hair-powder.

The coarse pulp which does not pass the sieve, is of great use in cleaning worsted curtains, tapestry, carpets, or other coarse goods.

The mucilaginous liquor of the potatoes will clean all sorts of silk, cotton, or woollen goods, without hurting the texture of the article, or spoiling the colour.

It is also useful in cleansing oil-paintings, or furniture that is soiled.

Dirty painted wainscots may be cleaned by wetting a sponge in the liquor, then dipping it in a little fine clean

clean sand, and afterwards rubbing the wainscot therewith.

Feb. 4th, 1805. ANNE MORRIS.

Various experiments were made by Mrs. Morris, in the presence of a committee, at the Society's house: the whole process was performed before them upon fine and coarse goods of different fabricks, and to their satisfaction.

PAPERS

IN

MANUFACTURES.

The GOLD MEDAL of the Society was this session voted to Mr. WILLIAM CORSTON, of Ludgate-Hill, for a substitute, of his invention, for LEGHORN PLAIT, for HATS, &c.

The following Communications were received from him, and specimens of the RYE-STRAW and of the PLAIT made therewith were placed in the Society's Repository.

GENTLEMEN,

I BEG leave to lay before your Society, two specimens of a manufacture which was never before made in this country, and for the purchase of which a very considerable sum is annually remitted to Italy, Germany, &c. It is called Leghorn-plait, and is made use of for ladies' and gentlemen's hats.

The annual importation, as entered at the custom-house for the last ten years, would

would furnish employment for five thousand female children and young women; and give cultivation to two thousand acres annually of very poor land to raise the straw, unfit for other culture. The two specimens sent were plaited at a school I have at Fincham, in Norfolk; and the straw is part of the produce of five acres I sowed last year in that county. I should feel happy to communicate every information respecting it that your Society may require; and if you, Gentlemen, should on investigation deem it entitled to an honorary reward, such a mark of your distinction I should feel proud to receive. I have been three years in bringing it to its present state of perfection, and I now trust it will not only prove of public advantage to this country, by preventing many thousand pounds a year being sent abroad, but will also be the means of diffusing private happiness to some hundreds of poor families, by the

the healthy and productive employment it will afford their children.

I remain, respectfully,

Gentlemen,

Your humble servant,

WILLIAM CORSTON.

Ludgate-hill, Dec. 17th, 1804.

To the SOCIETY of ARTS, &c.

An account of the quantity of Straw Hats imported into Great Britain in the last ten years, distinguishing each year and the countries from whence imported.

	Denmark.		Germany.		Flanders.		France.		Gibraltar.		Italy.	
	Doz.	No.	Doz.	No.	Doz.	No.	Doz.	No.	Doz.	No.	Doz.	No.
1794	.....		.....		360	0	.....		.....		3702	2
1795	.....		1165	0	.....		.....		.....		3696	0
1796	.....		1455	0	.....		.....		314	8	1010	6
1797	.....		3128	0	.....		1	4	.....		240	0
1798	.....		4499	2	.....		.....		.....		.....	
1799	.....		6615	6	.....		.....		.....		400	6
1800	.....		9718	6	.....		.....		.....		1602	1
1801	.....		3129	8	.....		.....		.....		235	10
1802	.....		2955	6	.....		.....		.....		6831	10
1803	1514	11	320	0	.....		.....		.....		12237	7
Total.	1514	11	32986	4	360	0	1	4	314	8	29956	6

Total Number, 65,133 dozen and 9.

Plait for Hats.

1800.. Nil.
1801.. 779lb.
1802.. 2396lb.
1803.. 2106lb.

5281lb.

Inspector-General's Office, Custom-House, London, July 7th, 1804.

W. IRVING, Inspector-General.

At five hats to a pound, 5281lb. will make 26405 Hats.
Add the dozens above-mentioned 781605

Total Hats 808010

GEN-

GENTLEMEN,

PRESUMING on a hope that the particulars of my experiment, and a slight view of the advantages which this new branch of industry opens to this country, may meet with attention from those who alone can patronize and forward its establishment; allow me to subjoin the result of an experiment upon part of five acres of rye sown last year, in Norfolk, on a poor and sandy soil, with two bushels of seed per acre; it was the third year of my attempting to produce the Leghorn-plait, from the growth of the seed of this country. I feel happy that I can now (after much trouble and expense) lay before you for inspection, specimens, made up in hats, both knitted and sewed, accompanied by the signatures of many respectable tradesmen in London, who have dealt in that article some of them ten, twenty, and thirty years, and could not discover the difference from the Italian Leghorn; and

if

if it be honoured with your approbation, it will strengthen my hope of seeing the waste land of this country rendered subservient to the industry of its poor, as well as to the national prosperity, by distributing at home the large sum which is at present annually remitted to a foreign market.

I selected two square yards from the thickest part of the crop, and likewise two from the thinnest; it was all pulled up by the roots; I tied them together, and again repeated the same. I manufactured one bundle at my school at Fincham, in Norfolk, the other at my house in Ludgate-street; and averaging both experiments, the produce was as follows, from four square yards.—The bundle measured ten inches in circumference, and weighed one pound with the seed; the straw was of four different sizes, the finest not measuring more than fifteen inches in length, the coarsest only twenty-four, including the root

root and ear. The part used in plaiting produced ten yards of Leghorn, of four different qualities, and the weight was one ounce; the grain, or seed, measured one-third of a pint, and weighed five ounces, the refuse straw eight ounces; the waste was two ounces in the four square yards. By this calculation, one acre will produce forty pieces of Leghorn of fifty-five yards in length, and employ for one week thirteen children to sort the straw, and eighty to plait it; and, allowing them four shillings each, the acre will furnish £18. 12*s*. 0*d*. in amount of labour bestowed on the produce.

The Right Honourable George Rose has obligingly favoured me with the annual account of imports for the last ten years, up to Christmas, 1803; they amount to 83 cases per annum, but the last year there was 180 cases imported; 83 cases contain 79,680 Leghorn hats to manufacture, which quan-

tity in this country would anually require the cultivation of 2,000 acres of waste land, and furnish employment for nine months in the year for 5,000 female children, from seven to fifteen years of age; their industry averaged at 4*s.* per week, would amount to £36,000. I have not noticed the number of hands that will be required to make up the hats, nor those employed in the cultivation of the land. I am indebted to the Houourable Mrs. Harcourt, for having procured for me three acres of Bagshot Heath; the General's steward has sown it for me with the rye-seed that grew on the five acres alluded to in Norfolk, and he has no doubt but it will answer the purpose.

I remain, Gentlemen,

Your humble servant,

WILLIAM CORSTON.

Ludgate-street, January 28th, 1805.

To the SOCIETY of ARTS, &c.

We

We hereby certify that Mr. Wm. Corston, of Ludgate-hill, has exhibited to us a specimen of plaited straw, manufactured by him in this country, similar to that imported from various parts of Europe, under the denomination of Leghorn. We have examined this specimen, and the hat made of the same article, and candidly confess we thought it Leghorn, until informed to the contrary.

J. J. Valloton, *Jermyn-street*
Joseph Robson, *Coventry-street*
Davies and Wain, *Sackville-street*
G. and R. Thompson, *Cockspur-street*
Harding, Shorland, and Co. *Pall-Mall*
Samuel Barlow, *Jermyn-street*
Walter Gladhill, *Jermyn-street*
Richard Cotton, *Duke-street*
Welchman and Masters, *Ditto*
E. Wheattall, *Ditto*
James Senier, *Bruton-street*
Thomas Smith, *New Bond-street*
Beamon and Abbott, *Bond-street*
W. Absalom, *Green-street*
Guidon and Hughes, *Golden-square*
George Sneath, *Duke-street, St. James's*
Morice and Penny, *Ludgate-hill*
Wells, Gilgrest, and Neville, *Fleet-street*
Middleton and Innes, *Ditto*
Richard Fisher and Son, *Ditto*

GENTLEMEN,

SINCE I had the honour, last Spring, of communicating to you my ideas on the benefits to be derived from the encouragement of the growth of rye-straw, for the purpose of making British hats resembling Leghorn, I have been enabled to prove the result of my experiment on Bagshot Heath. The Honourable General Harcourt has now the first hat made from the rye-straw grown on that barren waste, which is well calculated to produce it.

I cannot help expressing a wish that Government would set the example, by causing 1000 acres of the Heath to be cultivated; and when it is considered that the consumption is equal to the annual cultivation of 2000 acres, and the employment of 5000 poor children, I should humbly conceive it deserves the experiment. I am Gentlemen,

Your obedient servant,

WILLIAM CORSTON.

Ludgate-hill, December 2d, 1805.

To the SOCIETY of ARTS, &c. The

The SILVER MEDAL and FORTY GUINEAS were this Session voted to Mr. JOSEPH BEARD, of Coggeshall, in Essex, for a MACHINE for CUTTING and CROOKING WIRES for CARDS, employed in carding Cotton and Wool.

The following COMMUNICATIONS were received relative to this business, and a complete MACHINE, which makes two WIRES at once, is placed in the Society's Repository for public inspection, it being difficult to explain by an Engraving the construction of this ingenious Machine. A pair of cards made with the wires formed by this Engine are reserved.

SIR,

A NEIGHBOUR of mine, who for six or seven years has been exerting his mechanical talents, hath completed an engine for doubling, cutting,

and crooking of wire for cards, and I suppose it not to be equalled in any part of the world; it differs entirely from one I sent to the Society some years ago, invented by Mr. Kay, which cut only one wire at a time, and required a person to feed it; this cuts two at once, and on a more extensive plan will cut any number desired.

A child of eight or nine years old may work it with ease. If the Society would wish to see it, the inventor will attend them with the machine.

I am, Sir,

Your humble servant,

RICHARD APPLETON.

Coggeshall, October 1st, 1804.

CHARLES TAYLOR, Esq.

SIR,

WITH this you will receive an engine of my invention, for cutting and crooking wires for cards, and hope

hope you will be satisfied with its utility. I have sent with it certificates from F. Honeywood, Esq. and Mr. Richard Appleton, which I hope will be satisfactory, after the Society have seen the machine at work.

I am, Sir,

Your humble servant,

JOSEPH BEARD.

Coggeshall, April 1st, 1805.

CHARLES TAYLOR, Esq.

This machine occupies a space of about fourteen inches square; it is worked by a handle, on the axis of which a small fly-wheel is fixed; it receives two wires at the same time, from two barrels or reels, on each of which a coil of wire is placed; the wires are drawn forward from thence on turning the handle of the machine, they pass through two rollers, and are cut and double crooked as they advance within it; the wires, when properly formed for

pricking into the leathers, drop down into a receptacle under the machine.

Certificates in favour of the machine were received from Filmer Honeywood, Esq. of Marshall, and Mr. Richard Appleton, of Coggeshall. Mr. Appleton adds, that it is the completest machine in England; has been at work for his use for three weeks, and he has never seen such cards manufactured before; he states, that the advantages of the machine are,

First—The great expedition with which it does the business.

Secondly—The great extent to which it may be employed.

Thirdly—That it does not waste wire as other machines do, on account of its feeding itself, which is a very material advantage to the card-maker.

DEAR SIR,

WHEN I was in London, I promised you to get information from Yorkshire, respecting the machine you shewed me for cutting and crooking card teeth. My friend informs me there is a machine in use for cutting, and another for crooking, but not any that does both at the same time, and he expresses himself highly gratified to think there is such an invention as that at the Society, which he adds is certain to be of singular utility to manufacturers.

I remain, dear Sir,

Yours truly and sincerely,

MICHAEL NORTON.

Walness Lodge, near Manchester,
June 25th, 1805.

To CHARLES TAYLOR, Esq.

The

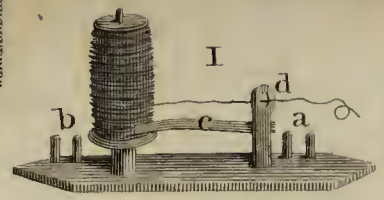
The SILVER MEDAL of the Society was this Session voted to Mr. JOHN AUSTIN, of Glasgow, for various IMPROVEMENTS made by him in Manufactures.

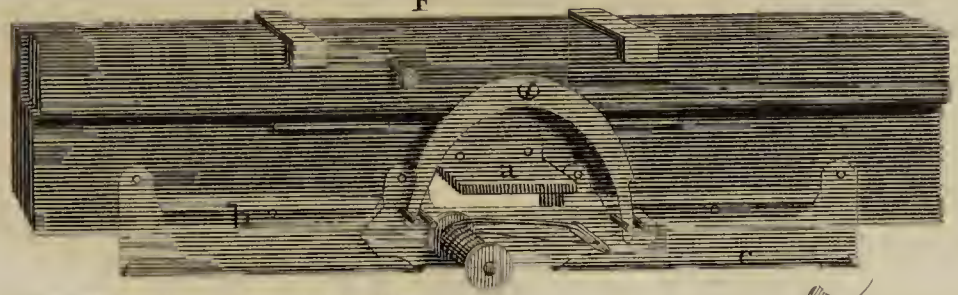
The following ACCOUNTS were received from him, and an explanatory ENGRAVING annexed.

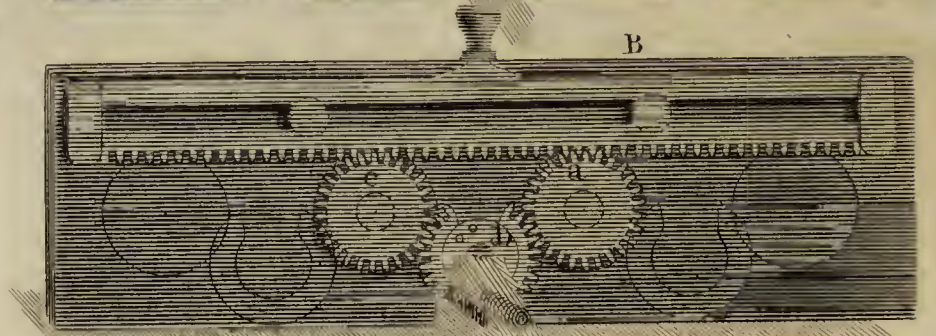
Models of the different articles are preserved in the Society's Repository, including, besides those employed in weaving, specimens of the types used in printing, which last are not shown in the engraved Plate.

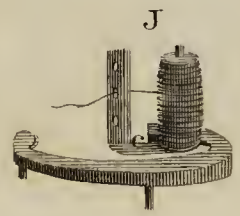
SIR,

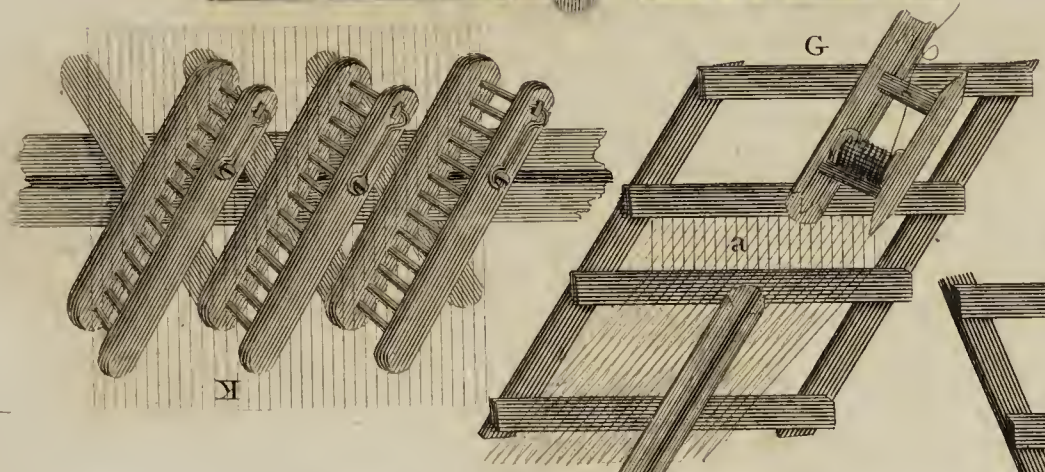
I BEG leave to lay before the Society of Arts, &c. the sundry articles after-mentioned. I have for a series of years exerted myself in endeavouring, by means of these and other inventions in machinery, and various simplifications

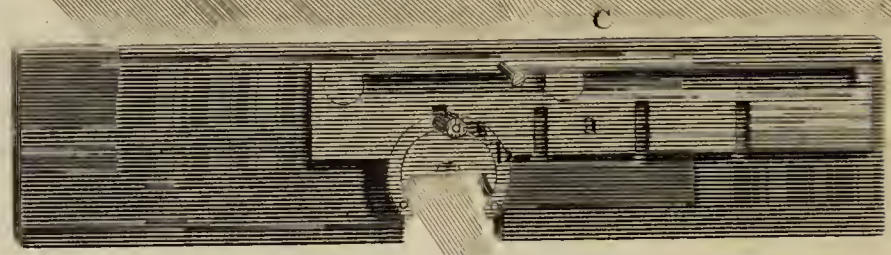


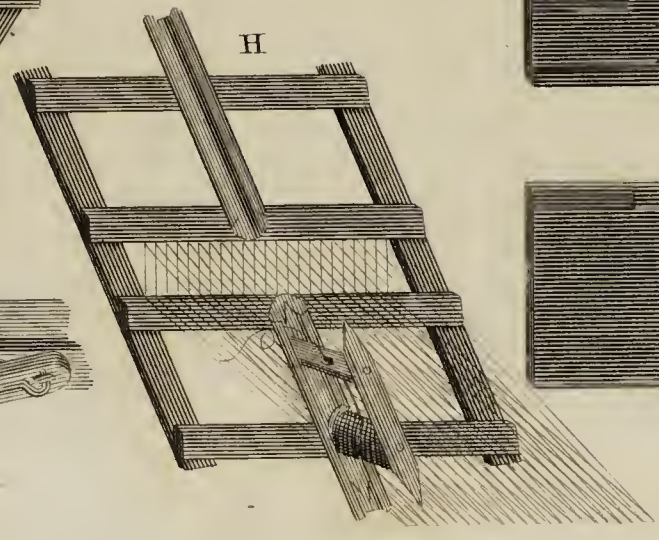


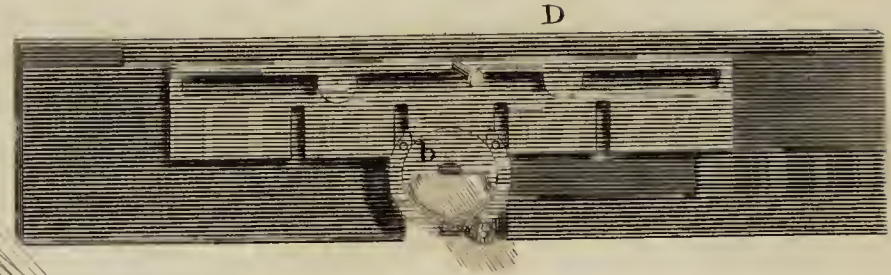


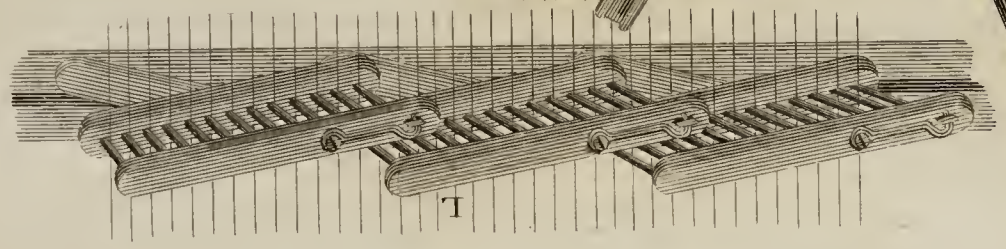












C. Varley del

S. Porter sculp.

tions and improvements of the same, to render the art of weaving more expeditious and less expensive than it has hitherto proved.

It was not till after much trouble and expense, and reiterated experiments, that I at length succeeded beyond my expectation, in answering the purposes intended; and, having met with approbation from manufacturers of the first respectability, and now that they are actually in practical use by tradesmen who find the advantage of them, I beg leave to submit them to the consideration of the Society, in the conviction, that from the models themselves, the certificates produced, and the character these give to my labours, the Society will be satisfied, upon examination, that they have not been entirely useless; and that they will bestow on them their approbation, and promote their encouragement, by such marks of distinction as they may think they merit.

I do

I do not wish it to be understood, as resulting from my own conviction, when I assert that these inventions and improvements will prove useful; or, that I depend upon certificates which have been readily granted by individuals; but upon these, joined to the regard paid by the Chamber of Commerce and Manufactures of Glasgow, of which I have had the honour of being a member from its commencement, and from my having above thirty years practice and experience, in the manufacture of clear lawns, cambric, and gauze; and as being one of three persons who first attempted the muslin manufacture in Scotland, now so eminent, and from study having acquired an intimate acquaintance with that manufacture through all its stages.

The benefits derived from machinery in a manufacturing and commercial country I need not point out. This country enjoys those benefits to an envied

vied degree; its manufactures are more expeditiously, and less expensively sent to market, enriching the state, and rendering the situation of the meanest mechanic more comfortable.

The spotting shuttles save clipping, and the waste of spotting yarn to nearly seven-eighths of its whole value; also the pattern is thereby much improved. *Fig.* A and B are worked by a single touch of the weaver's finger, although there be one hundred spots in the breadth of the web, and it is done in the same space of time that one of these spots was formerly worked by the weaver, who usually kept a boy on each side of him, each working spot after spot with his fingers; these spots are called brocaded, or finger spots. *Fig.* G H goes obliquely through the shed of the web, and will make any figure of a spot on a plain or twilled mounted web, without spotting hiddles or treadles. *Fig.* E F will answer with pressers

pressers to keep down the yarn that is not in the spot, without spotting hiddles or treadles, and other mounting formerly necessary.

The first was invented by me, and communicated by me to Archibald Mac-Vicar, who worked at such things for me, and who reduced it to the form C D.

The *Fig.* E F are improvements on these not yet in common practice.

Fig. K and L is an universal ravel or sniffle, useful at the beaming of all kinds of webs. This machine is of itself complete, and will beam from the coarsest to the finest web, and to any breadth required; whereas, by those in common use, one hundred and twenty different ones are necessary, the value of which is above £120, and the whole not so complete as one of mine, the expense of which does not amount to above the price of two of the medium

value

value of the common kind; namely, thirty shillings, which the machine-maker who made the first of them supplies them at. Country weavers are often at a great loss for the particular set or kind they want of the old kinds, and have to send many miles to procure one. In manufacturing towns weavers have joint sets of them, although few complete ones, and hire them to those who want them, whereas on my plan every weaver may have one.

I have also sent to the Society, specimens of types or figures, formed of burnt clay or porcelain, for printing patterns upon calicoes, or designs for articles to be sewed or tamboured. These types are not liable to be destroyed by fire, nor by lying in a damp place. They may be made to a certain depth, so as to be varied at pleasure to the taste or fancy, the same as letter-press printing types. A certain number may be marked on each type, to ascertain

ascertain the exact proportion of the price of tambouring or sewing, the rates of the same work being frequently very irregular for want of a regular standard to calculate them by.

They may be purchased at half, or even one-fourth of those cut in wood; they are equally durable, or more so, and may be made finer than any cut in wood.

I am, respectfully, Sir,

Your obedient servant,

JOHN AUSTIN.

London, No. 26, Noble-Street, Falcon-Square,
April 17th, 1805.

TO CHARLES TAYLOR, Esq.

Reference to Mr. Austin's Inventions.—Plate IV.

Fig. A, shews the machine or shuttle, for brocading or forming Jamdanna spots, or other designs on muslin, lawn, cambric,

cambric, silk, or other fancy goods, instead of using one spotting shuttle, and afterwards cutting away the yarn to loss, between the spots or figures, as formerly done between every shoot or cast of the shuttle. It is a frame of brass so long as the breadth of the web, the wheels of the size and at the distance required for each spot in the breadth of the web at equal distances. The knob or button of the teethed rack *a* being pushed backwards or forwards until the wheel *b* makes a full revolution with the pirn or bobbin shown at *Fig.* J, which is affixed to the wheel *b* in *Fig.* A, and which coming round under the warp-yarn raised for the spot, brings the yarn of which the spot is wove from the one side of the spot to the other: *c* in *Fig.* I, is a spring made of quill, steel, or brass, to prevent the spotting yarn coming off too quick, which spring, when the pirn is full, presses hard upon the yarn, and gives less pressure as it empties.

Fig. B is another view of the machine; A with the wheel *b* half turned round, which turns upon a large centre, part of which centre is cut off as represented; and when the communicating wheel *a* is opposite to the vacant part of the wheel *b*, the other wheel *c* turns it round, until a whole revolution is made alternately, and until the design or spot is finished.

Fig. C is another invention for the same purpose, and worked in the same manner with less machinery; there being only three teeth, or round pins in the pinion, which are driven by the rack or slider *a* with deep-cut teeth, as represented in the Engraving.

Fig. D is another view of the last, with the wheel *b* turned half round.

Fig. E and F show a third invention for the same purpose: by touching the knob *a*, the slide *b* goes backward and forward, and carries the arch *c* along with it, the two points of which come between

between the two points *a* and *b* of *Fig.* I, which is a small brass shuttle, of which there is one for every spot in the breadth of the web; it carries the spotting yarn through under the warp threads raised about *an inch only*, in place of three inches or more, formerly done for a single shuttle to the whole spots in the breadth of the web.

In *Fig.* I, *c* is the spring above described; *d* is a standard and hole through it answering to the eye of the common shuttle, through which the yarn runs.

In *Fig.* F, *a* is a plate of brass, which, as the slide and arch go along, takes against the inside of the arch, and raises and keeps up that end of the arch; but before that end loses its hold of the shuttle, the other end of the arch is between the other two points *a* and *b* of the shuttle *Fig.* I, at the contrary side of the warp yarn raised for the spot, so that the shuttle is never loose,

nor can it go out of its proper place, being also confined above and below by two grooves *b* and *c*, *Fig.* F.

In place of spot treadles to raise the warp of the spot, this may be done by pressers, to slide to any distance from the centre, and to keep down such part of the warp as is *not* to be in the spot.

Fig. G and H show a fourth method of making spots or figures, and will form any shape or pattern without raising the warp yarn, or having any pressers for that purpose. It consists of a jointed frame, as represented, partly above and partly below the web, which comes through the space *a*, *Fig.* G; and by moving the frame from the angle of *Fig.* G to the angle of *Fig.* H, or to any other angle between them, and while the upper and under shade, or half of the warp is open, you let down or raise up the shuttles, which going through the upper and under shade, according

to

to the angle given, will pass through the upper and under shade at different splits or spaces of the reed, and leave the spotting yarn as required in such part of the shade of any web, twilled, striped, checked or plain.

The frames of the machines, *Fig.* A, B, C, D, E, F, are set into two sliders at an angle of about seventy degrees, immediately from before and close to the reed to above the weaver's head, with cords, pullies, and weights, to overbalance and raise them in this direction six to eight inches, and are taken down by the foot with a treadle or pedal, cross, shaft, pullies, and cords.

Fig. G and H may be attached to the batten lay, or swinging frame and reed, or run on casters horizontally backwards and forwards.

Fig. K and L will show a very simple method of beaming webs of any number of half gangs, goes, runners, or equal quantities of warps or chains of yarn,

putting each division of the warp into each tooth or division of the ravel, sniffle, heck, rake, or frame, for regularly placing the chain or warp of a web on the beam; which when done, all that is necessary is to contract or expand the frame to the breadth of the web required, without paying any regard to the quantity or quality, which in the old way puzzles many good weavers, to calculate and to find one that will suit, as there are about one hundred and twenty different sets or scores, and quarter-scores of the kinds which are made and used as necessary for the purpose, and after all not exact.

Certificates in favour of Mr. Austin's Ravel were received from Mr. William Jameson, jun. Mr. Andrew Stephenson, Mr. Alexander Pollock, and Mr. William Miller; in favour of his printing types,

types, from Messrs. J. and J. Scott, Mr. Louis Ruffini, Mr. Alexander Patrick, and Mr. John Kirkland, all of Glasgow; and in recommendation of his mode of spotting or brocading muslins in the loom, and his other inventions, from the Directors of the Chamber of Commerce and Manufactures held at Glasgow, June 12, 1804.

PAPERS

IN

MECHANICKS.

Mr. G. Smart's Chimney Cleanser.

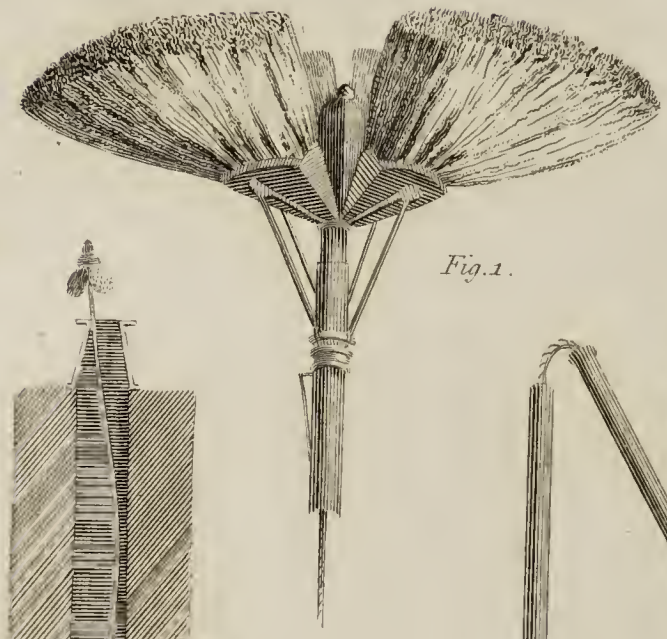


Fig. 1.

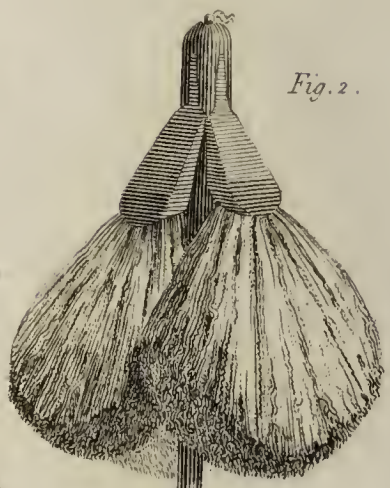


Fig. 2.

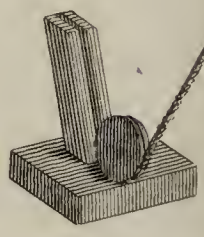


Fig. 6

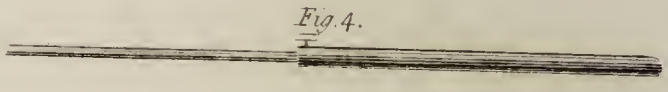


Fig. 4.

Fig. 5.

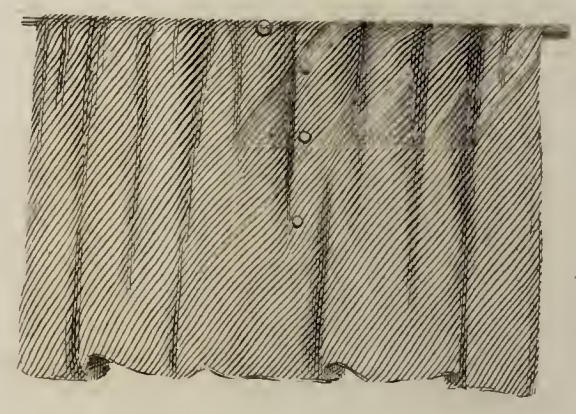


Fig. 3.

This plate is contributed by the Society for superseding the Necessity of climbing Boys by encouraging a new Method of sweeping Chimnies, and for improving the Condition of Children and others employed by Chimney Sweepers.

MECHANICKS.

The GOLD MEDAL of the Society was this session adjudged to Mr. GEORGE SMART, of the Ordnance Wharf, Westminster Bridge, in conformity to the Premium offered by them, Cl. 172, for CHIMNIES CLEANSED by MECHANICAL means, and in order to supersede the necessity of Climbing Boys, usually employed for the purpose.

The following ACCOUNTS and CERTIFICATES were received from him, and an ENGRAVING of the MACHINE employed by him to effect the purpose is hereunto annexed.

SIR,

IT is now nearly two years since I sent to the Society of Arts, &c. a machine for cleansing chimnies without the aid of climbing boys. I have since tried many other plans, such as joining

joining small ground rattans together with tubes, and the fastenings like that of a bayonet; but none have succeeded so well as the hollow tubes, with a cord passing through them, as hereafter described. One great improvement I have made in the brush, which now opens and shuts upon the principle of an umbrella, and shall send an improved machine, if the Society request it. I with this have sent a certificate, signed by a number of respectable housekeepers, for having cleansed by my machine three hundred and seventy-eight flues. My men have done some thousands, and I have six men and horses daily employed in it, which I mean to continue, until it is generally adopted by the master chimney-sweepers; many of whom, by the assistance of the Society for Improving the Condition of Climbing Boys, have now my machines in use in London, and most of the large towns in England,

and

and I hope, in time, will abolish the practice of children being sent up the chimnies. Some are so crooked that no machine will pass from the bottom, but they are few, about one in the hundred, these can be done with the same machine from the top; we have done a greater average number of narrow flues that no child could get up; others have been extinguished when on fire, by placing a wet cloth over the brush and putting it up the chimney.

I am, Sir,

Your most obedient servant,

GEORGE SMART.

Ordnance Wharf, Westminster-Bridge,
22d January, 1805.

CHARLES TAYLOR, Esq.

Description of Mr. Smart's Chimney Cleanser, and method of using it.—See Plate V.

The principal parts of the machine, are the brush, the rods for raising the brush,

brush, and the cord for connecting the whole.

Fig. I. and II. show the brush, consisting of four fan-shaped portions, connected by hinges so placed that the brush in ascending the chimney may lie close, taking up as little space as possible, and in descending may expand or spread out so as to occupy and sweep the sides of the flue; in drawing the machine down the chimney, the brush is prevented from contracting, by a contrivance exactly resembling what is used for umbrellas. *Fig.* I. represents the brush expanded; *Fig.* II. as contracted. The substance of which the brush is usually made, is called whisk, the article of which carpet brushes are formed; other substances may be substituted.

The rods which force up the brushes are hollow wooden tubes, with each a metal socket at the lower end; some of the sockets have a screw in them, for

the

the purpose of confining the cord, and preventing the rods from separating, as shown at A, *Fig.* II. The upper ends of the rods are now made without ferrules, and are somewhat taper, so as to allow a small motion within the sockets. Two feet and a half is found a very convenient length for each rod.

The cord runs from the top of the brush through all the rods, and, when drawn tight, keeps the whole of the machine together, so as to form one flexible rod throughout. Cordage manufactured at the School for the Indigent Blind, St. George's Fields, is well calculated for this purpose.

Fig. III. represents a cloth, to be placed before the chimney-piece, and hanging on a bar, which admits of being adjusted to different-sized openings.

Fig. IV. A bar composed of two pieces, one sliding out of the other (like a telescope slide), and furnished with a screw for fixing it at different lengths.

Three

Three of these bars make part of the apparatus belonging to the machine, one for fastening up the cloth (as in *Fig.* III.) is placed horizontally, and the other two upright, for closing the sides of the cloth to the jambs of the chimney-piece.

Fig. V. shows the machine raised up the chimney, with the operator working it, he being placed on the outside of the cloth.

Fig. VI. a part of the apparatus called the purchase, consisting of a small post and pulley fixed on a board, for the purpose of more easily drawing the cord tight before it is screwed down.

Method of using the Machine.

Having first ascertained, by looking up the chimney, what course the flue immediately takes, the cloth is then to be fixed to the chimney-piece, with the

the horizontal bar shown in *Fig.* III and IV. and the sides to be closed with two upright bars of the same sort.

The next part of the operation, is to introduce through the opening in the middle of the cloth *Fig.* III, the brush in its contracted form *Fig.* II; this opening should then be buttoned or tied up, to prevent the soot coming into the apartments; then the rods with the cord passing through them being laid in order upon the hearth, one of the rods is to be slided forward on the cord into the socket, on the lower end of that rod which supports the brush; the other rods are in like manner, one by one in succession, to be pressed up until the brush is raised somewhat above the top of the chimney, observing to keep the cord constantly tight; and when those rods which have a screw in the socket are brought up, they are to be placed on the purchase *Fig.* VI, when the cord is to be put round the pulley and drawn

very tight and screwed down; by which means all the rods above will be firmly connected together, and the whole may be considered as one long flexible rod.

When the operator thinks that the brush is near the top of the chimney, he should move it up and down, as he will then find the brush, if out, stop in returning on the top of the pot or chimney.

When it is known to be out, the machine is to be pulled down; in doing which the lower edges of the brush pressing against the top of the chimney, will cause it to expand, and there being a spring to prevent it from contracting again, it will sweep the soot down before it as it is drawing downwards.

The whisk being long and elastic, makes the brush capable of filling flues of different diameters.

In drawing down the machine, the person should grasp with his left hand and support the rod immediately above

that

that which he is separating with his right hand, otherwise it may happen that those above loosen and slide down the cord, which will render the operation more difficult; the rods, as they are brought down, are to be laid carefully one by one with the cord within them, in as small a compass as they can conveniently be placed, that they may not dirt the apartments.

When the brush is quite down, it is to be shaken withinside the cloth, then the spring must be pushed, and the brush which was expanded, will contract like an umbrella into its original small space.

If, as it sometimes happens, there is a difficulty found in drawing down the brush when in the upper part of the chimney, the rods must be thrust up again somewhat higher, in order to alter the direction, and then be carefully drawn down.

It will be proper to let the cloth re-

main a short time up, where great cleanliness is required, in order to let the finer particles of soot subside within it.

For extinguishing a chimney on fire, a coarse cloth is to be tied over the brush, and dipped into water, then passed up as above directed.

When the machine has been laid by, the joints of the brush should be oiled before it be used.

One person is sufficient for performing the whole of the work with this machine; but it will be found more convenient to have an assistant to give up the rods to him who is using it, and to replace them on the ground when brought down.

It seems, from the great experience which now has been had with this machine, that about ninety-nine chimneys out of a hundred may be cleaned by it, and the remainder can probably be cleaned by some of the following means: either,

either, First, by having a fixed apparatus at the top, with a chain descending down the flue and a brush annexed to it; Second, by getting to the top of the chimney, and letting down a rope and brush as practised in Edinburgh and other places; Third, by using the machine now recommended, by entering it at the top of the chimney, and forcing it downwards.

Certificates have been received by the Society from nearly one hundred housekeepers in London and its environs, whose chimnies have been swept by Mr. Smart's machines, and who have expressed their satisfaction at their execution of the work.

Although Mr. Smart is engaged in a very extensive line of business more beneficial to himself, yet for the sake of humanity, and in order to prevent the miseries attending children who fall

into the employment of common chimney-sweepers, he undertakes to provide persons to cleanse chimnies in his method, or will sell machines ready made for the purpose, at a moderate price.

The

The SILVER MEDAL and THIRTY GUINEAS were this Session voted to Mr. GILBERT GILPIN, of Old-Park Iron-works, near Shifnal, for his Improved CRANE and Flexible CHAINS.

The following COMMUNICATION was received from him; an explanatory ENGRAVING is annexed, and MODELS of the CRANE and CHAIN are reserved in the Society's Repository.

SIR,

HAVING discovered a method of working chains of the common construction, over pullies, in all directions, more safe and flexible than the best hempen ropes, and at the same time equally uniform, I have sent by the Shrewsbury waggon, for the inspection of the Society for the Encourage-

ment of Arts, Manufactures, and Commerce, a full-sized pulley in wood, and a piece of a chain, together with a model of a crane, exhibiting its manner of application.

From its simplicity of form, and facility of manufacture, the common chain, formed of oval links, has been in use from the earliest ages; and that it did not answer every purpose of a hempen rope in working over pullies, was not owing to its peculiar form, but from an error in the application.

Every chain of this nature has a twist in itself, arising from a depression given by the hammer to each link in the welding*; and this circumstance, so trifling in appearance, is not so in its effects, and it has in consequence a perpetual tendency (even when reefed perfectly straight in pullies, and on the

* The twist may be seen by holding the piece of the chain by one end, and viewing the links edgeways as it hangs down.

barrels

barrels of cranes) to assume a spiral form, which a plain cylindrical barrel, and the common pullies with semicircular grooves, are not in the least calculated to prevent. Hence the alternate links of the chain, in coiling round a barrel, or working over pullies, form obtuse angles in assuming the spiral form, bearing upon the lower parts of their circumferences, and forming as it were two levers, which wrench open and crush each other in proportion to the weight suspended, as well as prevent the freedom of motion in the links themselves, and thereby load the chain with additional friction.

A still greater obstruction to the uniformity of its motion, is the tendency which the chain has to make a double coil as it approaches the middle of the barrel and crosses its centre, and that of the pullies at right angles, by means of which the chain is frequently broken by the sudden jerk caused by the

the upper coil slipping off the undermost.

It is to these causes that all the accidents that occur to workmen and machinery from the failure of chains may be attributed (bad iron excepted), and which form the sole objection to their becoming a general substitute for ropes.

As a preventive to these evils, I have grooves cast in iron pullies, of sufficient dimensions to receive the lower circumferences of the links of the chain, which work vertically; those which work horizontally and form the gudgeon part of the chain (if we may be allowed the expression), bearing upon each side of the grooves.

The barrels are also of cast iron, with spiral grooves of the same dimensions, at such distance from each other as to admit the chain to bed without the danger of a double coil; by these means the links are retained at right angles

angles with each other, the only position for free and uniform motion.

The links of the chains are made as short as possible, for the purpose of increasing their flexibility, and they are reefed perfectly free from twist, in the pullies, and on the barrels, for the same reason.

When applied in blocks, the grooves in the pullies prevent the different falls of the chain from coming in contact, and render plates between them (as in the common way) totally unnecessary; the pullies are in consequence brought closer together, the angle of the fall from block to block considerably diminished, and the friction against the plates entirely avoided. Brass guards, with grooves opposite to those in the pullies, are riveted to the blocks, to prevent the chain getting out of its birth from any accidental circumstance. This method of working chains I first put in practice for Messrs. T. W. and B. Botfield, at these works, in July last; and

and it is applied in the working of cranes capable of purchasing from ten to fifteen tons; in the working of the governor balls of steam-engines constructed by Messrs. Boulton and Watt, and in the raising of coal and ore from the mines, for which purposes ropes had before been solely used at this manufactory. In all cases it has performed with the utmost safety, uniformity, and flexibility; so much so that the prejudices of our workmen against chains are entirely done away, and they hoist the heaviest articles with more ease, and as great confidence of safety as they would with the best ropes.

The same method is applicable, at a trifling expense, to all machines at present worked by ropes, or by chains, in the usual way: and all the common chains now in use, may be applied to it with equal facility.

With a view of ascertaining the relative flexibility of ropes and chains, I

wedged

wedged an iron pulley, thirty-one and a half inches in diameter, on the spindle of the pinion of a crane of the following description, viz.

Barrel, 30 inches diameter;
Wheel, 64 teeth;
Pinion, 8 ditto;
Top block, with three pullies of 12 inches diameter;
Bottom block, with 2 ditto, ditto.

To the large pulley I attached a small rope, for the purpose of suspending the weights in the hoisting of the different loads, and the results were as follow:

The Crane was loaded with	Took to hoist the loads when reefed with theChain in grooved pullies *	Ditto, when reefed with a half-worn tarred strand-laid rope, $3\frac{1}{2}$ inches in circumference	Ditto, when reefed with theChain promiscuously as in the common way
lbs.	*lbs.*	*lbs.*	*lbs.*
First ..2000	63	74	80
Second 1000	32	39	41
Third .. 500	17	21	22
Total..3500	112	134	143

* All the experiments were tried with the same grooved pullies.

The

The flexibility is inversely as these momenta, and proves the superiority of chains; for (on the average of the trials) with the chain in the grooves,

One pound raised	31,25 lbs.
With a half-worn strand-laid tarred rope, three inches and a half in circumference, - -	26,11 do.
And with the chain in the usual way, only	24,47 do.

It also appears (contrary to the general opinion), that chains are safer than ropes; for it is an established axiom, that those bodies whose fibres are most in the direction of the strain, are the least liable to be pulled asunder; and in our examination of the properties of a rope, we find that the strands cross the direction of the strain in undulated lines, and consequently prevent its uniform action thereon. A rope is subject to this inconvenience even when stretched in a direct line, but more particularly

ticularly so when bent over a pulley, as in that position the upper section moving through a greater space than the under one, is acted upon by the whole strain; and hence the frequent breaking of ropes in bending over pullies, from the double strain overloading the strands of which the upper section is formed.

The links of a chain are subject to the transverse strain, where they move in contact; but as such strain is in proportion to the length of the bearing, it must be very trifling. All the links having axles of their own, *the chain moves simultaneously with the strain, and both are in consequence retained in continual equilibrio.* A chain in grooves will therefore sustain as great a weight when bent over a pulley, as it will in a direct line, and consequently is safer than a rope.

A safe, uniform, and flexible method of applying chains in the working of machinery,

machinery, has long been a desideratum in the arts; for they are but little affected by exposure to the weather, or the heat of manufactories, whilst either produces the speedy destruction of ropes.

The discovery is of additional importance, as it substitutes a durable article for a very perishable one, and gives employment to our own manufactories at the expense of foreign importations.—The durability is at least six to one in favour of chains.

Though the model of the crane is chiefly intended to convey a proper idea of the new method of working chains, yet I trust it will be found to possess several other advantages in point of construction, which are entirely new, and calculated to increase the safety and durability, as well as to lessen the expense of that useful machine.

On reviewing the principles of a crane,

crane, we find that the gudgeons are the points of resistance to the machine and its load, and consequently the effect of the transverse strain upon the perpendicular, will be in proportion to the distance of the mortise for the gib from the upper one; and that of the oblique strain, in proportion to the distance of the mortise for the diagonal stay, from the lower one.

Notwithstanding these circumstances are so evident, they are seldom attended to; for in general a large and expensive piece of oak, sufficient of itself to make a crane of double the purchase, forms the perpendicular; the gib is mortised into it, at eighteen or twenty inches from the top, to make room for the gudgeon, as is the diagonal stay, at five or six feet from the bottom, to allow a birth below for the barrel. Thus the effect of the transverse and oblique strains of the gib and diagonal stay upon the perpendicular, is increased by

their distances from the gudgeons, or points of resistance, and the perpendicular itself considerably weakened by mortises made where the greatest strength is required. Hence the frequent failure of cranes of the common construction, by the breaking of the perpendiculars in the mortises.

It appears, however, that the various parts of a crane formed of wood, cannot be connected together in any other way than by mortising; and as this method *considerably diminishes the strength of the timber*, I make use of cast-iron mortise pieces.

The perpendicular is formed of two oak planks, each eighteen inches wide, four thick, and sixteen feet long; these, at the top and bottom, are let into cast-iron mortise pieces, which retain the planks ten inches asunder. The barrel for the chain, works between them. The piece at the top contains in the middle a dove-tailed mortise, into which a

stock

stock for the gib is fixed; for greater security, an iron bolt goes through the whole; the stock projects two feet from the mortise, and a plank eighteen inches deep, and four thick, is bolted to each side of it to form the gib, the interstice between the planks forming a birth for the top block to slide in. The diagonal stay is of the same dimensions, formed in a similar manner, and connected to the perpendicular, by being let into the lower mortise piece.

In this mode of construction scarcely any part of the timber is cut away; and the strength of the materials, so far from being diminished, is augmented by the cast-iron mortise pieces, the gib is brought much closer to the upper gudgeon, and the centre lines of the perpendicular and the diagonal stay, crossing each other at the top of the lower one, places the whole strain as near as possible in a line with the gudgeons. The business of the perpendicular becomes

in consequence little more than that of a mere prop, and consequently requires no greater strength of materials than the diagonal stay.

The top block is made of cast iron, and has a groove three inches deep on each side, for the purpose of embracing the planks which form the gib.

To prevent the inconvenience of the dirt of the floor getting into the brass of the lower gudgeon, and thereby obstructing the revolution of the crane, those parts are reverse to the common way, the gudgeon being fixed in the floor, and the socket part which embraces it is cast in the bottom of the mortise-piece, as is also a channel to convey oil to the gudgeon.

I am, Sir,

Your most humble servant,

GILBERT GILPIN.

Old Park Iron-works, near Shifnal,
April 16th, 1804.

CHARLES TAYLOR, Esq.

Reference

Reference to Mr. Gilbert Gilpin's Crane, Pl. VI. *Fig.* 1, 2, 3, 4.

Fig. 1, Represents the crane with all its parts complete, ready for work.

A B, The perpendicular, formed of two oaken planks, each eighteen inches wide, four thick, and sixteen feet long, let into cast-iron mortise pieces C D.

E E, The barrel for the chain which works between the two planks of the perpendicular.

F, The top piece, containing in the middle a dove-tailed mortise, into which H, a stock for the gib, is fixed; an iron bolt goes through the whole, for greater security. The stock projects two feet from the mortise, and two planks I, K, eighteen inches deep, and four thick, are bolted one on each side of it, to form the gib, the interstices between these planks forming a

birth or space for the top block L to slide in. This block is made of cast iron, and has a groove three inches deep on each side.

M, The diagonal stay is of the same dimensions as the gib, formed in a similar manner, and connected to the perpendicular by being let into the lower mortise-piece D.

N, The handle or winch which turns a small pinion O, fixed on the same axis; this pinion works in the teeth of the wheel P, moving on the same axle as the barrel E, on which the chain R lies in spiral grooves.

S, The block and hook by which the goods are raised.

Fig. 2, Is a side view of the handle N, the pinion O the toothed wheel, and the barrel E placed betwixt the two uprights A B.

Fig. 3, Shows upon an enlarged scale part of the barrel E, and some of the chain lying in its proper position

Mr. Parker's Machine for Shoemakers.

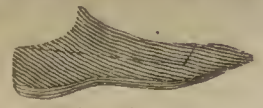


Fig. 6.

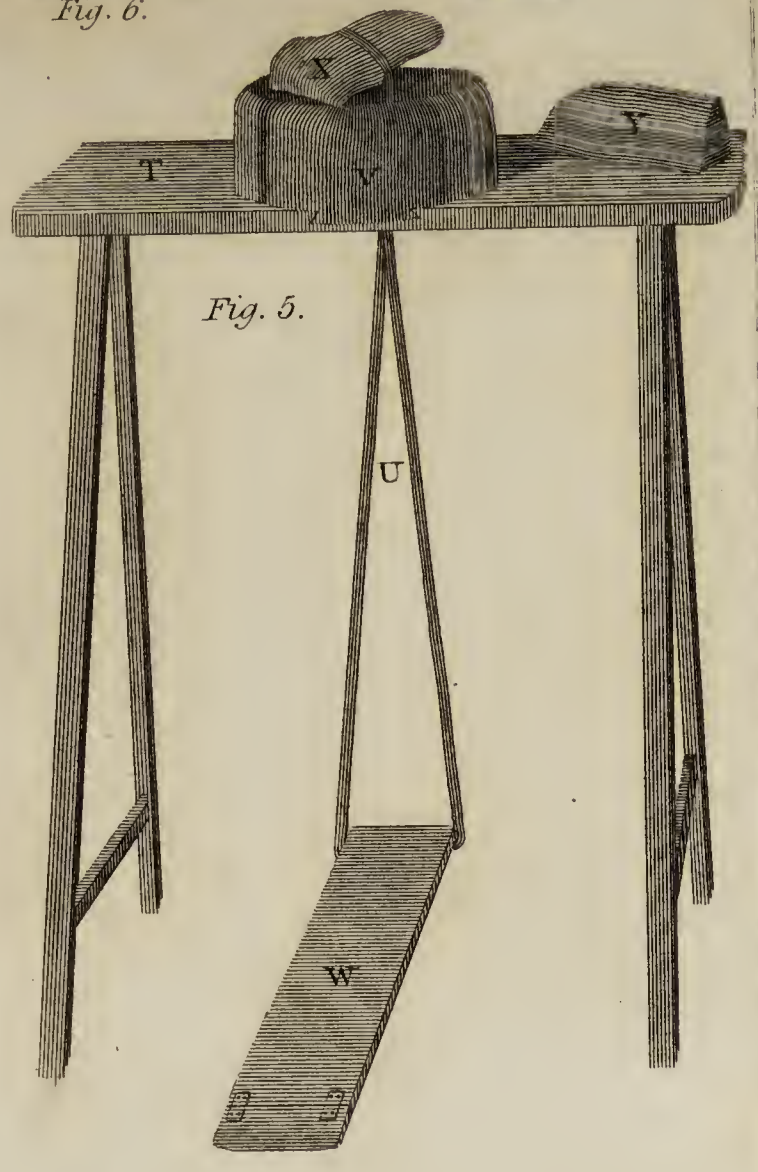


Fig. 5.

C. Varley del.

Mr. Gilbert Gilpin's Crane for raising Weights.

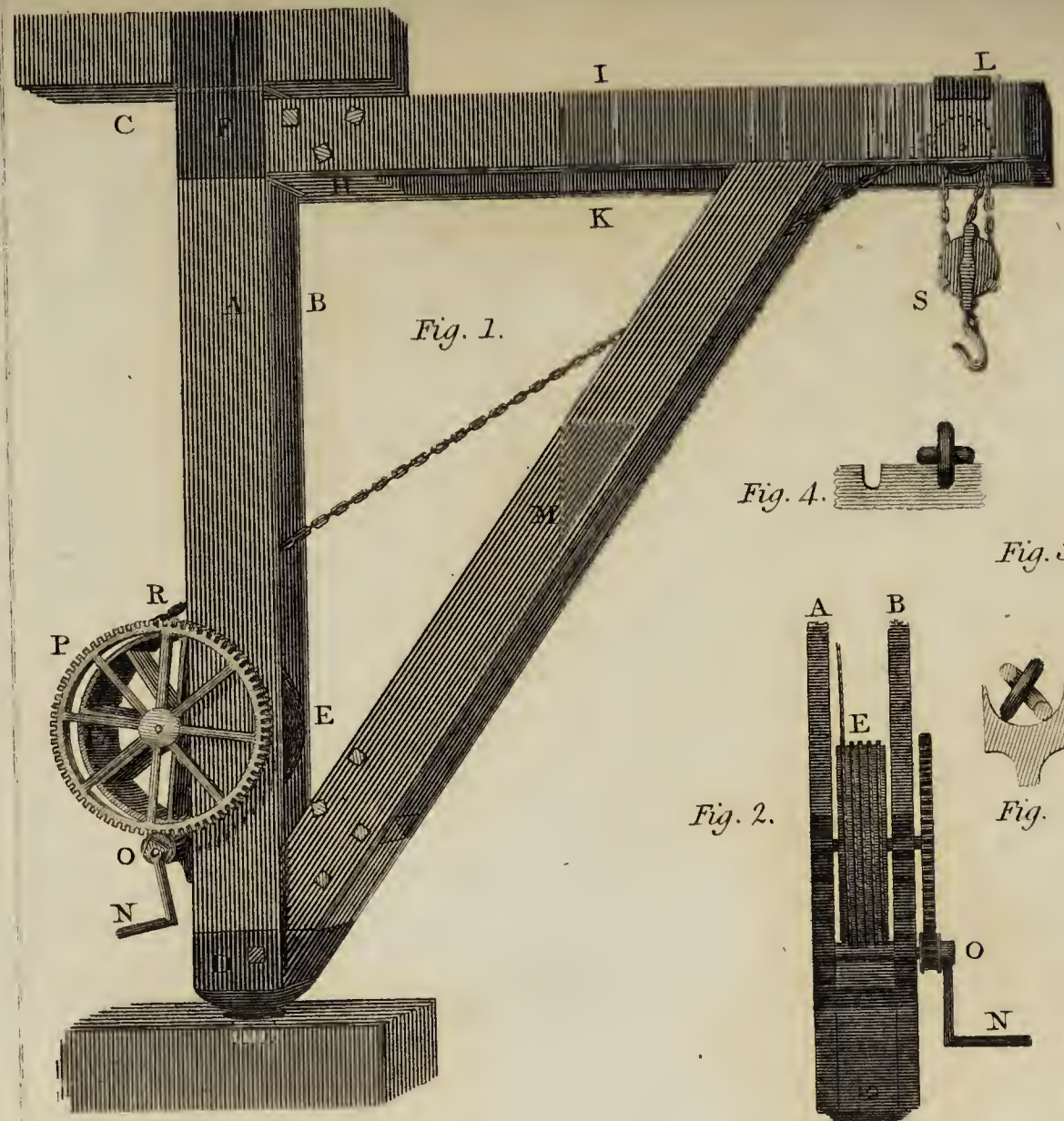


Fig. 1.

Fig. 4.

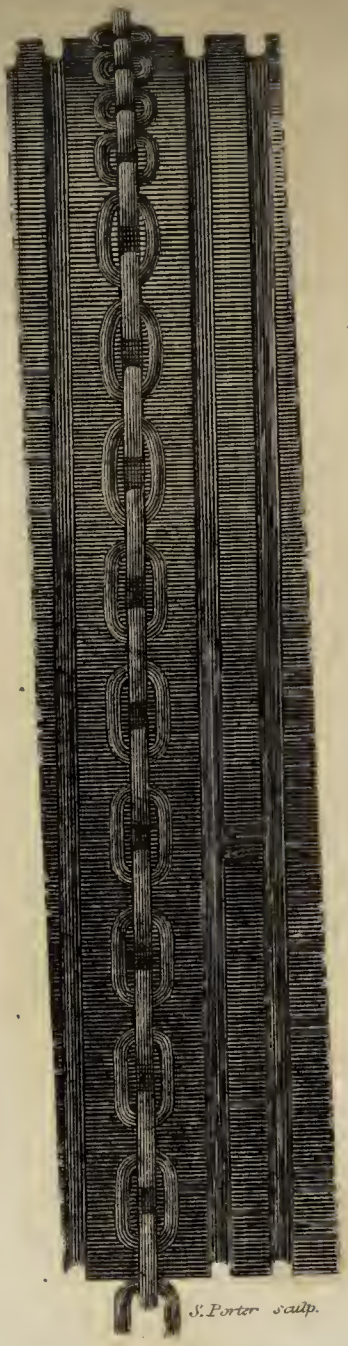


Fig. 3.

Fig. 2.

Fig. 7.

S. Porter sculp.

position in one of the spiral grooves, or channels: it is to be noted that the lower edge of one link lies in the groove, and the next link upon the surface of the barrel, and that by this means the chain is prevented from twisting in winding upon the barrel.

Fig. 4, Shows a section of part of the barrel E, in order to point out clearly the manner in which one link lies within it, the other link on its outside; it is contrasted by *Fig.* 7, the old method of working chains.

Certificates, dated November 22d, 1804, from Thomas Blackmore, John Swift, John Ball, Joseph Felton, Benjamin Heylehurst, Benjamin Hunt, and Thomas Hatchhess; who declare that they were present at the trial of the experiments above mentioned, that they had also seen the new method of working chains in daily use for upwards of

sixteen months, and are certain, that in that way chains work much more flexible than hempen ropes, and equally as safe and uniform.

Further certificates from Messrs. I. W. and B. Botfield, lessees of Old Park Iron-works, and Isaac Hawkins Browne, Esq. landlord of the said works, confirm Mr. Gilpin's statement; and further add, that the method is calculated for chains of all sizes, and for machinery of every description; that it is employed at their works with great success, in the working of cranes and mill machinery, and in the raising of coal and ore from the mines. That his chains applied in this manner are a complete substitute for ropes, and will prevent those fatal accidents which too frequently occur to the workmen and machinery, in the working of chains in the usual way. That Mr. Gilpin's crane is also constructed upon stronger and more durable principles than those in general use, and completely answers its purpose.

FIFTEEN GUINEAS were this Session voted to Mr. THOMAS PARKER, No. 6, Blue-Cross-street, Leicester Fields, for a MACHINE for the Use of SHOEMAKERS, to enable them to do their work in a standing posture.

An ENGRAVING of the MACHINE is hereunto annexed; one of the MACHINES is reserved in the Society's Repository; and the following COMMUNICATION was received from him,

GENTLEMEN,

CONVINCED of the utility of the bearer's invention, I trust I am guilty of no impropriety in recommending it to your serious attention, and, relying on your benevolence, I am persuaded, that if you see it in the light which I do, you will bestow on the inventor a suitable reward. It is needless for me to expatiate on the merit of the invention;

invention; I know that the inventor gets his living in my employment, and does all his work (which is in the branch of boot-making) at the bench he offers for your inspection. Dr. Buchan† describes its utility far better than I can pretend to explain it, and demonstrates how far the inventor ought to be encouraged. Here I beg leave to insert two quotations from his work, in page 49 of which he says, "Many of those who follow sedentary employments, are constantly in a bending posture, as shoemakers, tailors, cutlers, &c. Such a situation is extremely hurtful: a bending posture obstructs the vital motions, and of course must destroy the health; accordingly such artificers are generally complaining of indigestion, flatulencies, head-aches, pains of the breast, &c." and in page 50, he further adds, "A bending posture is likewise hurtful to the lungs; when this organ is compressed, the air cannot have free access to all its parts,

† Domestic Medicine, pp. 48, 49, and 50.

so as to expand them properly: here tubercles, adhesions, &c. are formed, which often end in consumptions; besides, the proper action of the lungs being absolutely necessary for making good the blood, when that organ fails, the humours soon become universally depraved, and the whole constitution grows weak."

I believe I have said all that is necessary on the subject, and beg leave to subscribe myself

Your most respectful
and obedient servant,
W. HEATHER.

9, Cockspur-street, Nov. 7th, 1804.

To the SOCIETY of ARTS, &c.

In consequence of the above letter, Mr. Thomas Parker, the inventor of the machine, was desired to attend with it upon a committee appointed by the Society,

ciety, on the 22d of November, 1804, and then informed them, that he had used this apparatus for twelve months past, and found it very useful. That all the work of shoe-making may be done therewith standing; but that in some parts thereof he finds an advantage in using along with it a high stool; and that before he used this machine, he never saw or heard of a similar invention; and that he has found it of great service to his health.

He stated the cost of such a machine to be about two guineas.

Reference to Mr. Parker's Machine for Shoemakers, Plate VI. *Fig.* 5, 6.

Fig. 5.—T. The bench standing on four legs, about four feet from the ground.

V. A circular cushion affixed to the bench, in the centre of which cushion

cushion is an open space quite through the bench, through which hole a leather strap U is brought up from below. This strap holds the work and last firm upon the cushion, in any position required, by means of the workman's foot placed upon the treadle W.

X, Shows the last upon the cushion, with the strap holding it firm.

Y, An implement used in closing boots.

Z, A small flat leather cushion, useful in adjusting the last and strap.

Fig. 6. The shoe-last shown separate from the cushion. The round cushion is formed of a circular piece of wood, covered with leather, and stuffed with wool or hair to give it some elasticity.

The

The SILVER MEDAL of the Society, and TEN GUINEAS, were this Session voted to Mr. ROBERT SALMON, of Woburn, for his GEOMETRICAL QUADRANT and STAFF.

The following COMMUNICATIONS were received from him, and an explanatory ENGRAVING is annexed.

The Instruments are preserved in the Society's Repository, for the inspection of the public.

SIR,

HEREWITH you will receive my quadrant and explanation of the same. I have also sent the staff, which I presume may be useful for the purpose of trying any experiment. On the staff, I beg leave to point out an improvement which I made, and have had in use for some years; it is the screw at the

the bottom, which I have never seen applied but to my own cross staffs. By means of this screw, the staff may be readily fixed in the ground, in a manner that it could not be without it, nor could the instrument be used without such screw.

I am, Sir,

Your obedient servant,

ROBERT SALMON.

Woburn, March 20th, 1803.

CHARLES TAYLOR, Esq.

Description and manner of using Mr. Robert Salmon's Geometrical Plotting Quadrant, Level and Calculator, for the use of Navigation and Land-Surveying; ascertaining inaccessible distances, and for demonstrating and determining various Problems in Geometry and Trigonometry, Plate VII.

On the instrument and parts thereof, are engraved the names given by the inventor,

inventor, and made use of in these explanations; the *base* line being that at right angles with the 90 degrees on the *arch*, as it is also to the *perpendicular*, which perpendicular always moves parallel to the 90 degrees. For the use of land-surveying, where the instrument can be made stationary, the sight (marked *a*, *Fig.* 1, *Pl.* VII.) with the small hole in it, must be applied; but for sea-service, the one *b*, *Fig.* 2, with the mirror, must be substituted in its place.

Every person who has had occasion to describe or calculate the parts of the right-lined figures used in geometry, perspective, surveying, navigation, dialing, architecture, &c. &c. must have perceived, that all of them are resolvable into the most simple of figures, a *triangle*, or some number of them.

Hence the great importance of geometry and trigonometry, in teaching, either by construction or calculation, the knowledge of all the properties or

relations

Mr. R. Salmon's Geometrical Quadrant & Staff.

Fig. 1.

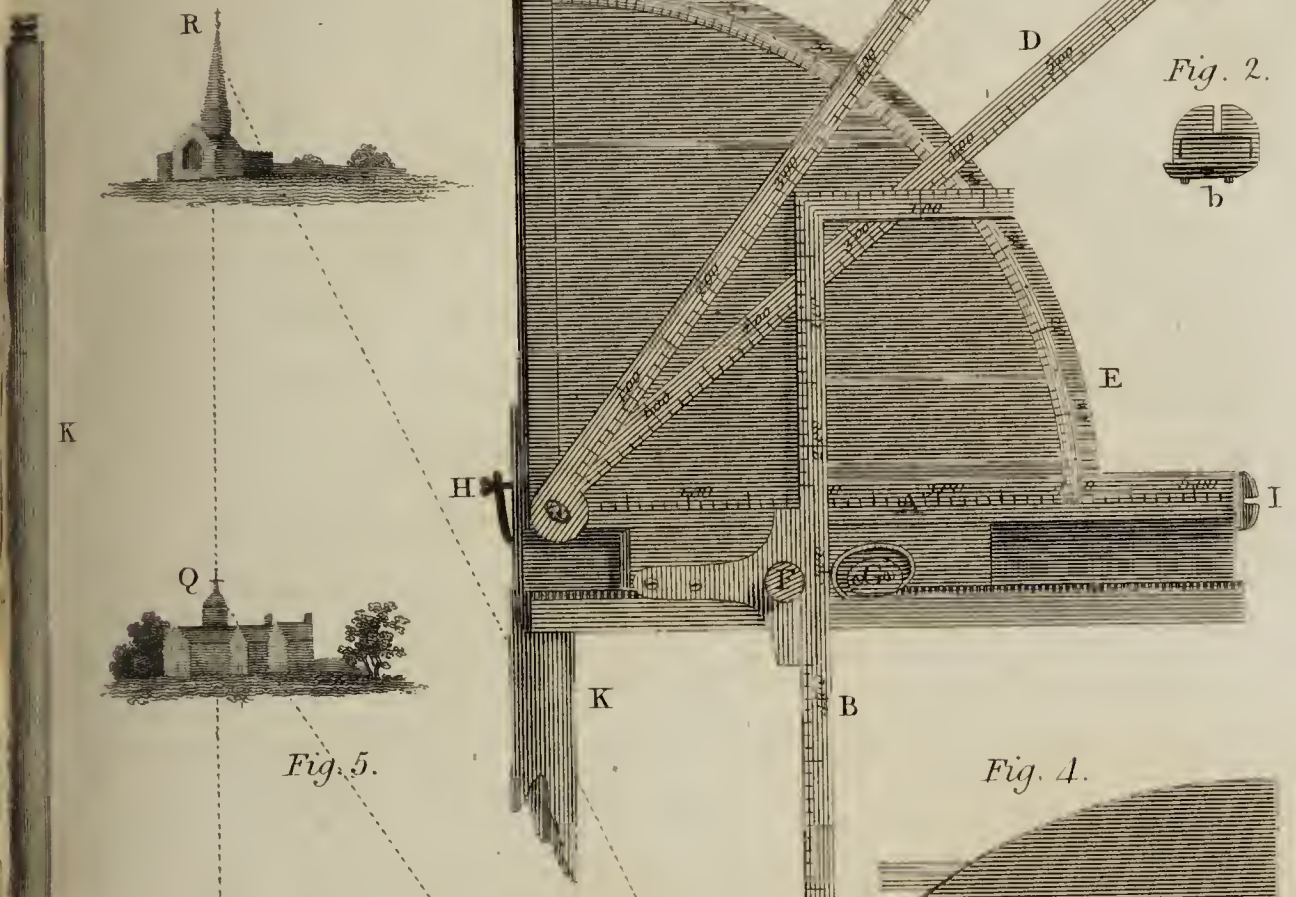


Fig. 2.

Fig. 3.

Fig. 5.

Fig. 4.

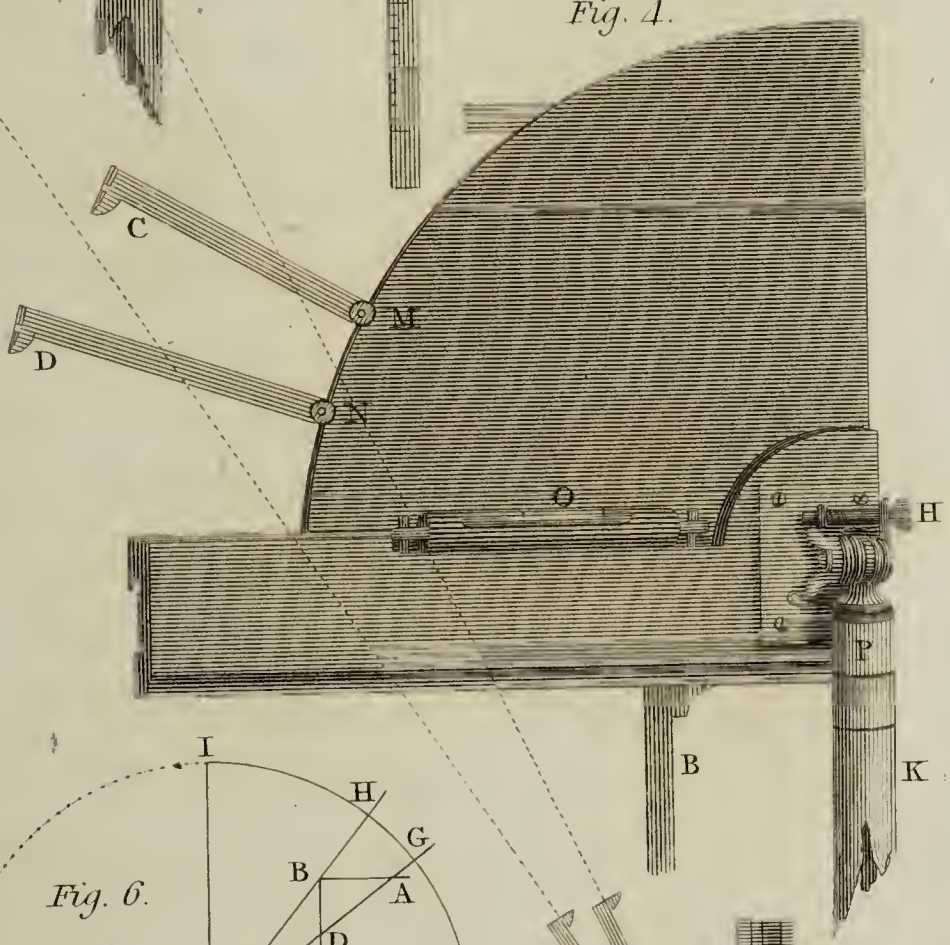
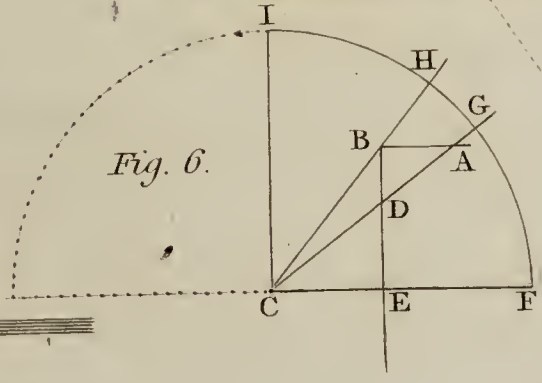
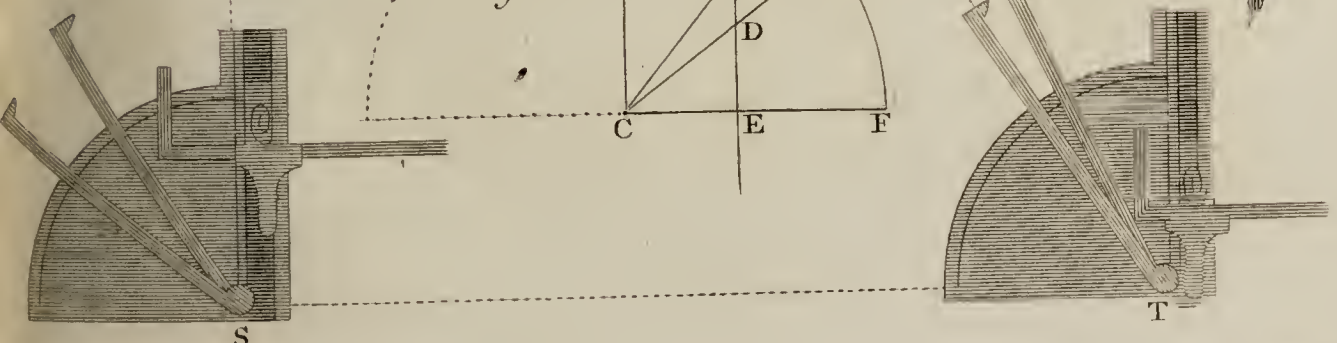


Fig. 7.

Fig. 6.





C. Varley del.

S. Porter sc.

relations between the three sides and three angles, of which every plane triangle is composed. Euclid having demonstrated, in the fourth proposition of the sixth book of his Elements, that in any two *similar triangles* (by which he means their having the same angles, without regard to the actual lengths of their sides, for one triangle may be very small and the other ever so large) every pair of the corresponding sides in the two triangles are proportional; it is the business of trigonometry to solve such problems, with the help of the tables of sines and tangents, or of sectors, sliding or other rules, and scales, by which you can find, on inspection, a *right-angled* triangle, exactly similar to any given right-angled triangle, (or having one of its angles equal to 90°) which can be proposed, or can occur in practice; and by the Rule of Three we say, *as* any side of the tabular triangle *is to* the similar side, supposed to be known, of the triangle under consider-

ation, *so is* any other side of the same tabular triangle, *to* the corresponding side supposed to be sought, of the triangle in question. It is evident, that by means of the *base-line*, *perpendicular*, and either the *upper*, or *lower limb* of my instrument, by the two motions of which the *perpendicular* is capable, and the angular motion of which the *limbs* are capable; any right-angled triangle whatsoever, as C B E, or C D E, in the diagram *Fig.* 6, *Pl.* VII. may be instantly formed, (by bringing the top corner of the *perpendicular* to touch the *limb*) with the same or greater facility, than it could be taken out of a trigonometrical table, measured by the compasses on the sector, or set on any instrument now in use for that purpose. But no instrument that I have seen or read of, is capable of forming immediately, *any obtuse-angled triangle*, as on my *geometrical plotting quadrant* can be done; nor can the trigonometrical tables be applied, to produce the sides and angles of such a

triangle

triangle without some trouble in any case; and in some of the most useful cases in practice, the labour is very considerable. I shall therefore give the solution of five problems. First, supposing, that *Figure* 6, *Pl.* VII. represents my instrument, set to answer this and the following problems; A, B, C, being the triangle under consideration; then since the ∠ A C E, is by Euclid (I. 20) equal to the ∠ B A C, it is evident that this angle will be shown, or may be set, by means of the divisions on the arc F G; also, that since C B E, and I C B, are also equal, the *arc* H I, with the addition of 90° (for the angle E B A), will show the ∠ C B A, of the triangle; it is equally evident, that the *arc* F H will show the sum of the two ∠s B C A, and A C F, at the same time that the lengths of all the sides may be read off, on the divisions or scales, on C A, C B, and B A. Therefore:

FIRST.—*To construct or set a triangle, having two of its angles and the side between them given.*

Set the limb C G, to the division at G upon the *arc* answering to one of the angles, say A, and make it fast, then to this ∠A add the other given angle, (which we will call C) and set *the other limb* C H, and make it fast at the division H, on the arc answering to the sum of their degrees; then on the *limb* C G, seek the length of the given side C A; next, push the *perpendicular* up or down, till the *parallel* cuts the point A, (always observing, the divided edges are those you work to), and by the help of the mill-headed *nut*, move the *perpendicular*, till its top corner just touches the *limb* C H, say in the point B; when it is evident that the degrees on the arc H I, added to 90°, is equal to the angle B, and that the other sides C B, and B A, may be read off thereon. Or supposing C B D to be the triangle, whose

whose angles B and C and side B C are given, we have only to move the *limbs* so as to make I H equal to B, and H G equal to C, and then to bring the top of the *perpendicular* to touch C H, at the division B, answering to the side C B, when the other ∠ D will be shown by the division on the *arc* G F, adding 90° thereto and; the remaining sides C D and B D may be read off on their respective scales.

SECOND.—*To set a triangle, having two sides and the angle included between them given.*

Let A B C be the triangle, A B and A C the given sides, and A the given angle; first set the *limb* C G to the division answering to A, then bring the *parallel* up to the point A, answering to the side C A, and by the *nut* move the *perpendicular*, till B A answers to the given side B A; next bring down the *limb* C H to touch B, and on C B may be read the other side, while H G

will show the angle C, and I H + 90° the ∠ B, whence all the six parts are known.

THIRD.—*To set a triangle, having two sides and an angle opposite to one of them given.*

Let A B C be the triangle, A C and C B the given sides, and A the given angle; first read the angle A on F G, and set the *limb* C G thereto; then push up the *parallel* to the division at A, answering to C A, and with one hand work the *nut* and with the other move the *limb* C H, till they touch at B, the division answering to the side C B; then B A is the side sought, and the arc G H will show the ∠ C, and I H + 90° the ∠ B.

FOURTH.—*To set a triangle, having two angles, and a side opposite to one of them given.*

Let A B C be the triangle, A and C the given angles, and B A the given side; first, set F G to the ∠ A, and G H to

H to the ∠ C, then push the *perpendicular* up or down with one hand, while the other works the *nut*, till the given side B A, on the *parallel*, is applied exactly between the *limbs* C H, and C G, then I H + 90° will show the remaining angle B, and on C B, and C A, may be read the lengths of those sides.

FIFTH.—*To set a triangle, whose three sides are given.*

Let A B C be the triangle; on the *limb* C H seek the point B, answering to the side C B; then, using one hand to move the *perpendicular*, and the other to turn the *nut*, let an assistant at the same time, with his right hand, gently move the *limb* C H, while you cause the top corner of the *perpendicular* always to touch the point B; at the same time let the assistant move the *limb* C G with his left hand, till the lengths of C A, and B A, on their respective scales, are found to intersect each other,

when F G will show the ∠ A, G H the ∠ C, and H I + 90° the ∠ B.

My solution to the last problem, is inferior to the common method of plotting the triangle on paper, and measuring the angles with a protractor; but I have introduced it here, to show that my instrument is capable of solving this, as well as all other cases of obtuse-angled triangles, and might, by extending the *arc* to a semicircle, as shown by the dotted lines on the figure, solve any triangle. In the practical problems in surveying, which follow, the triangles can always be taken right or obtuse angled, and the instrument as at present constructed is fully competent. I might here add, that a given line can readily by my instrument be divided into any number of equal parts; drawings might be enlarged or diminished, as readily as with the proportional compasses, and many other equally useful purposes may be effected thereby.

FIRST.—

FIRST.—*To measure an inaccessible distance, by a perpendicular line set off towards the right hand, from the line or base between the observer and object.*

Set the *base-line* of the instrument, in a line pointing to the object, at the same time place a staff at any distance at pleasure, as a perpendicular (being 90 degrees from the base). On this perpendicular measure any distance (say 50 yards or other measures) as a second station; move the instrument to this distance, and place it with its *perpendicular* in the same line as before; the instrument being so placed, set the *lower-limb* pointing to the object, and with the screw make the same fast; this done, the distance of the object will be thus readily known. Raise the moving *perpendicular* of the instrument to the division 50 (as before suggested), then with this height move the same by means of the *nut*, till the extremity intersects exactly the *lower-limb* before set,

set, at which intersection, the distance from the second station will be shown; and on the *base-line* will also at the same time be seen the distance from the first station: this is a case of right-angled triangles.

Note.—As the divisions on the *perpendicular* are denominated (either feet, yards, poles, or other measures), so will the distances be indicated on the other *limbs*, and on the *base* of the instrument.

SECONDLY.—*To determine the distances of any two inaccessible objects, both objects lying in a right line from the observer.*

As before directed, place the instrument with its *base* in the line of the objects; then by means of the *upper-limb* set at 90 degrees, place a staff as a perpendicular at any distance at pleasure (say 50 as before). This done, remove the instrument to this second station, and place it so that the *upper-limb* (still

(still at 90°) may be in the same line as when at the first station; this done, move the *upper-limb* into the direction of the nearest, and the *lower-limb* into the direction of the most distant object; which *limbs* being so set, and made fast, the distance of both objects from the second station will be seen on the two *limbs*, and the distance from the first station at the same time seen on the *base-line*, by setting and moving the *perpendicular* as directed in the last case. This is also a case of right-angled triangles.

THIRDLY.—*To measure an inaccessible distance in an oblique angle, where a right angle cannot be obtained, by reason of some impediment on the ground.*

At the first station, from which the distance is required, place the instrument; then set up a staff in any attainable direction, to any distance at pleasure (the more distant the better). The instrument being set, with its *base*

in

in direction to the staff, with one of the moving *limbs* take the angle of the object, and with the screw fix it thereto. This done, move the instrument in the direction of its base (being between the first station and staff set up) to any certain distance, (say 50 yards or measures) as a second station. From this second station again take the angle of the object, and thereto fix the other moving limb; this done, the distance both from first and second station, as also the bases and perpendiculars thereto will thus readily be seen. Set the *perpendicular* at random to any height, move the same till the upper point intersect the *upper limb*, or that most distant from the *base*, then read off on the *parallel*, the divisions parallel to the base subtended between the two *hypothenuses* or *limbs*; if this distance or division be equal to the distance measured on the base line, (*i. e.* 50) then the distance of the object from both

stations

stations will be shown on the two *limbs*, as will also the base and perpendicular on the respective lines. If the divisions on the *parallel* do not agree with the distance measured, the *perpendicular* must be altered till that division be shown, when the required distance will be given. This is a case of our first problem.

FOURTHLY.—*To level, or measure the altitude of any object.*

It is only necessary to set the plane of the instrument vertical, instead of horizontal, by means of the joint under the instrument, whence it is evident every case may be known as on the horizon; and to level, it is only requisite to set the *spirit level* at the back of the instrument, the *base-line* and every object cut by the same will be level thereto.

FIFTHLY.—*To take angles or altitudes at sea, where the instrument cannot be made stationary.*

For this purpose, it is first requisite to change the *sight* a, *Fig.* 1, and substitute

tute the one b, *Fig.* 2; which being firmly fixed and adjusted at right angles with the upper-limb, it is evident that when by reflection any object be brought to coincide on the *mirror*, at the extremity of the *base-line*, with another object seen in the direction of such *base*, the angle will then be known, being double what the upper-limb denotes on the *arch*, to which true angle, or its double, the *lower-limb* may be fixed, leaving the one with the *mirror*, again at liberty to take another observation and angle, at any distant place, or time; which being so taken, this *limb* may be also moved and fixed, to double its apparent angle, and the altitude or distance be then determined, by setting the *perpendicular* and *parallel* as in other common cases on land.

From this mode of determining distances, as the use of calculations and of tables of sines and tangents are superseded, it is presumed that much convenience will arise to the unlettered who

who may have occasion to use it, and thereby the errors of calculations will be avoided.

As well as the before-mentioned purposes to which the instrument applies, it is presumed there will be found other things which it will perform, some it is hoped useful, and some amusing, amongst which may be enumerated, Multiplication, Division, Rule of Three, Double Rule of Three, &c.; determining the area or sides of any sort of triangle from any proper data; determining the inscribing or inscribed circle of any triangle, square, or polygon, showing a mean proportional between two numbers, &c.

It is presumed, that an instrument, if perfectly made, on a large scale, would be found very useful and accurate in various practical calculations, as well for making them, as for proving them after made in figures.

The following are specimens of the manner of calculating by this instrument.

First Question.—*If* £100 *in* 12 *months produce* 80 *shillings interest, what will* £200 *produce in* 18 *months, and also what will it produce in* 12 *months?*

On the *base-line* of the instrument set £100. On the *perpendicular* set 80 for shillings interest. Then bring the *lower-limb* to intersect, which angle will then be, as per question, equal to 12 months at all places on the *base;* having so fixed the *lower-limb*, move forward the *perpendicular* till it intersect the *lower-limb* at the height 12 on the *perpendicular*, then raise the *perpendicular* to 18, and to the extremity thereof fix the *upper-limb* to intersect, which angle will then be in proportion as 18 to 12 to the *lower-limb*, being equal to the different times. The limbs being so fixed, it is only requisite to move the *perpendicular* to 200 on the *base;* and, raising the *perpendicular* till it intersect the upper-limb, you will have thereon the answer 240 shillings,

and

and at the same time, at the intersection on the lower limb 160, being the interest for 12 months only.

QUESTION SECOND.—*To determine the inscribed or inscribing circle of any polygon, the side being given; for example, the hexagon whose side is* 100 *feet.*

Set one of the limbs to half the angle included in the required side of the hexagon (*i. e.* 30 degrees), then set the *perpendicular* to the height of half the side given, being as per question 50. Then move the *perpendicular* till the extremity intersect the *limb* before set, on which at such intersection, will be denoted the radius of the inscribing circle, and at the same time may be seen on the *base* the radius of the inscribed circle.

QUESTION THIRD.—*To find a mean proportional between* 600 *and* 200.

This depends on the well-known property of a right-angled triangle.

Set the *perpendicular* on the *base* line, at the distance of half of the

 difference

difference of the two numbers (*i. e.* $\frac{600 - 200}{2}$); this done, raise the *perpendicular*, and move either of the *limbs* till the extremity of the *perpendicular* intersect thereon at half the sum of the numbers, being 400. This done, the height of the *perpendicular* will show the proportional required, being 347.

Note.—On the plate in which the perpendicular slides, will be found Nonius's for subdividing the divisions on the base or perpendicular, into 10 divisions.

Reference to the Engraving of Mr. Salmon's Geometrical Quadrant and Staff, Plate VII.

Fig. I. represents the face of the quadrant, on which A is the fixed base line; B the moveable perpendicular; C the upper limb; D the lower limb; E the arc; F the nut, which moves the perpendicular by means of a rack and pinion.

G, a spring to keep the perpendicular steady; H, a screw for fixing the joint of the staff; *a* the eye-piece, or sight, with a small hole in its centre; I, I, I, the sights for direct vision, consisting of only a small slit in each. When objects are to be viewed by reflection, as with a Hadley's quadrant; the sight *a* at the centre is taken off, and the sight *b* with a mirror, shown at *Fig.* II. on rather a larger scale than the former, must be substituted.

Fig. III.—K is the staff, the mode of applying which to support the instrument when in use, is shown by the same letters in the other figures; L is the screw, by which the staff is fixed firm in the ground.

Fig. IV. represents the back of the quadrant; M M are the screws, by which the upper and lower limbs are fastened after taking an observation.

O, a spirit-level; H the tightening screw for the joint before noticed; P the socket attached by its joint and

tightening screw to the back of the quadrant; the staff K is screwed into the above socket.

Fig. V. shows the practical method of using the instrument for determining the distances of the objects Q and R from the two stations S and T, at which the instrument is to be successively placed, and used as before described.

Fig. VI. is the diagram referred to at page 294.

Fig. VII. represents the mode of applying the tightening screw H, in *Fig.* I. and IV. by means of the semicircular spring, enclosing the cylindrical stem, or neck of the joint.

TEN GUINEAS were this Session voted to Mr. PETER HERBERT, No. 33, Bow-street, Covent-garden, for an improved BOOK-CASE BOLT.

The following COMMUNICATION was received from him. A Drawing of the Bolt is annexed, and a Model is reserved in the Society's Repository.

SIR,

I HAVE taken the liberty of laying before the Society a model of my invention, which I hope is sufficient to explain my intention. I intended it for a library book-case bolt, to facilitate the opening of both doors at once, and to secure the same, without the trouble of bolting two bolts in the common way. It will do for wardrobes, French casements, or folding sash doors. It will also make a good sash fastening,

if let into the bottom sash, with a small brass knob to slide as common; it would bolt in the frame by the side of the sash cord, both sides at once. I can also make it to answer sundry other useful purposes if required.

I remain, Sir,

Your obedient humble servant,

PETER HERBERT.

No. 33, Bow-street, Covent-garden,
Dec. 31st, 1804.

To CHARLES TAYLOR, Esq.

Reference to the Engraving of Mr. Peter Herbert's Book-case Bolt, Plate VIII. *Fig.* 3, 4.

K L, *Fig.* 3, represents the two stiles of the doors of a folding book-case.

M, the key-hole of a lock with two bolts, which are more clearly shown at *Fig.* 4, where the back of the lock N shows the two bolts of the lock pressing back

Mr. Peter Herbert's Book Case Bolt.

Fig. 3.

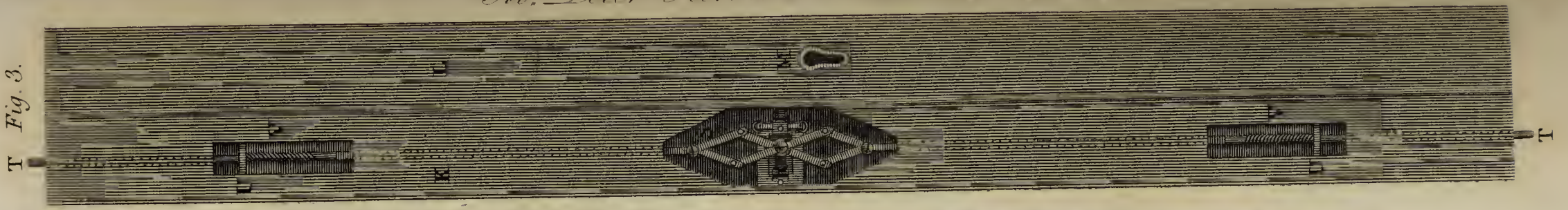


Fig. 4.

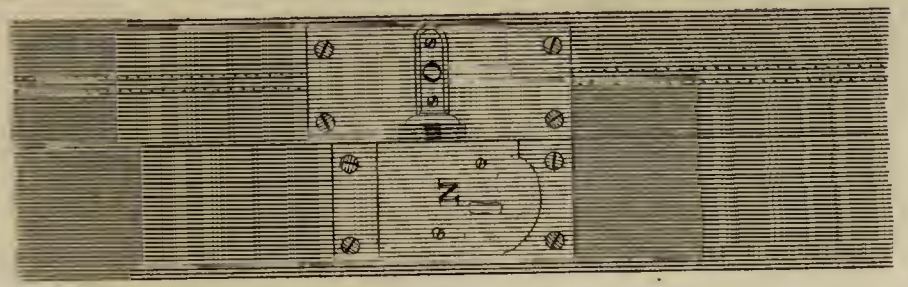
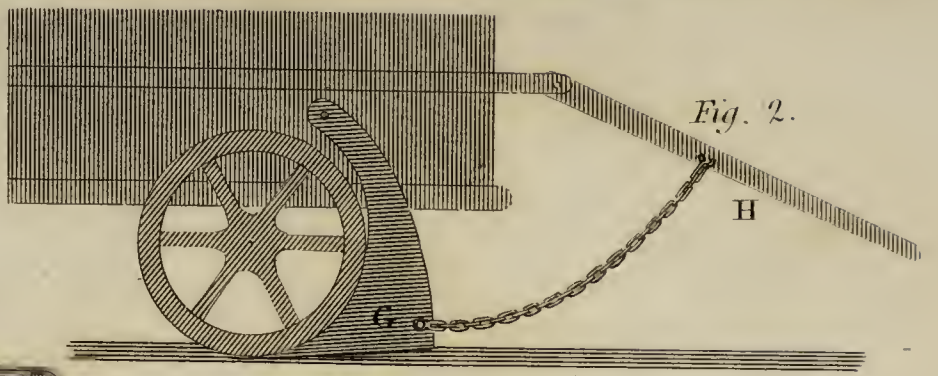


Fig. 2.



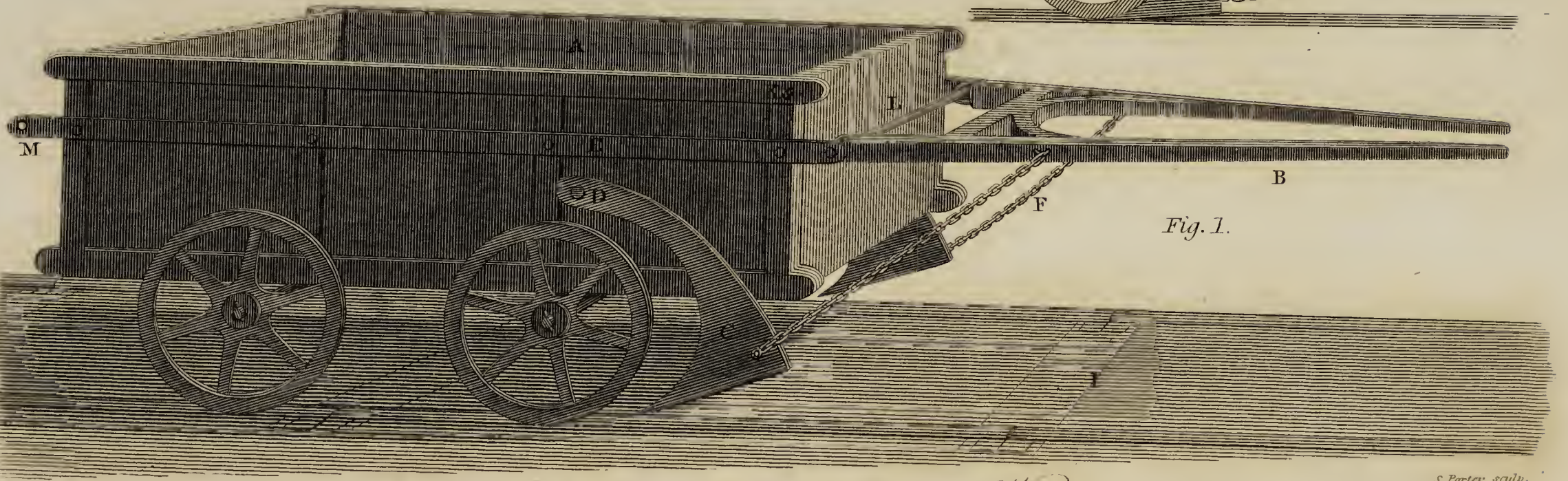


Fig. 1.

C. Varley del.

S. Porter sculp.

Mr. Le Caan's Check to Carriage Wheels.

back a sliding-piece O; on the front part of this sliding-piece in *Fig.* 3, two small friction rollers ar placed at P, in the act of pressing against two levers, crossing on one common fulcrum R, to each end of which, shorter levers S S above and below are connected by joints. These short levers act upon two long bolts, whose extremities are shown at T T, having each a helical spring at V V. In the state as engraved, the doors are locked and bolted.

On drawing back the bolts of the lock by means of the key, the helical springs, V V, press against the plates U U, through which the long bolts pass; they force back the long bolts and sliding-piece O, and allow both the doors to open.

TEN GUINEAS were this Session voted to Mr. CHARLES LE CAAN, of Llanelly, in Carmarthenshire, for his Invention of a CHECK to CARRIAGE-WHEELS on Rail-roads.

An Engraving of the STOP or CHECK is hereunto annexed, and the following COMMUNICATIONS were received from him.

A Model of this Invention is reserved in the Society's Repository, for the inspection of the public.

GENTLEMEN,

THE utility arising from the conveyance of heavy bodies, on tram or rail roads, daily demonstrates their superior excellency over any other method as yet adopted.

I have, gentlemen, viewed its operation in different quarters of the kingdom,

dom, and have witnessed several serious accidents, for the want of some useful instrument to assist the horse whenever he may be overpowered by pressure, or fall by accident. To perfect so desirable a mode of conveyance, I have turned my thoughts to this subject, and I beg leave to submit to you a drawing of my invention, which from its simplicity I flatter myself will convince you of its value, and may no doubt, with a little variation, be united to carriages in general, and become of public utility.

I am, Gentlemen,

Most respectfully,

Your obedient humble servant,

CHARLES LE CAAN.

At Garraway's Coffee-house,
or Llanelly, Carmarthenshire, April 4th, 1805.

To the SOCIETY for the
ENCOURAGEMENT of ARTS, &c.

GEN-

GENTLEMEN,

THE model of a rail-road waggon and check or stop, which I have this day the honour of presenting to you, I trust on examination will be found to possess the means of preventing those various accidents which have from time to time proved fatal to the horses employed in such service, particularly where the declivity is from twelve to sixteen inches to the chain, and the trade on such road principally descending.

The use of a horse employed on a rail-road is as frequently to check the velocity of a waggon or waggons loaded, (generally to the weight of two tons and a half each) so as that they may not exceed a certain degree of motion, as well as to draw them on such parts of the road as approach near upon, or quite to a level. When the horse finds himself

himself pressed upon beyond his power of resistance; to relieve himself, he is compelled to quicken his pace, by which means the velocity of the waggon exceeds any government during the continuance of the declivity, which gave it such action: under such circumstances, the least trip of the horse terminates in a fall, by which, from the formation of a rail or tram road, the animal becomes injured, notwithstanding every manual exertion. For the preservation of that valuable animal, and as a preventive to all such accidents in future, I turned my thoughts to the invention of the simple check or stop now before you, and which may be appropriated to carriages in general use.

As the utility of rail-roads daily increases in the opinion of the public, I trust every invention that may perfect such a system, will add in some degree to its value, and aid in its advancement

to

to perfection, an object so desirable as the conveyance of every species of merchandise, and so requisite in a commercial country.

I am, Gentlemen,

Your very obedient humble servant,

CHARLES LE CAAN.

Llanelly, Carmarthenshire, April 11th, 1805.

To the SOCIETY of ARTS, &c. Adelphi.

Reference to the Engraving of Mr. Le Caan's Check or Stop, for Carriages on Rail-roads, Plate VIII. *Fig.* 1, 2.

Fig. 1.—A. A rail-road waggon.

B. The shafts in the direction as when drawn by a horse.

C C. The checks or stops made of oak, and shod with strong plate-iron; these checks should always be made somewhat thicker than the wheels.

D. A

D. A bolt and nut on which the stop C hangs: it is here fixed to the side of the cart, but it will be better for this bolt and nut, to pass through the iron bar E, to which the shafts are connected, and the stop to hang from thence.

F. Chains which keep the checks suspended whilst the horse is drawing, but at such a distance from the wheels, as to permit the checks to assume the position G, in *Fig.* 2, when the shafts are inclined as at H, in consequence of the horse falling from pressure or accident; in which case, the waggon instantly stops, and prevents the horse from receiving any material injury, which the momentum of two or more waggons, arising from their velocity on roads upon an inclined plane as I, *Fig.* 1, has unfortunately frequently occasioned.

It is necessary to observe, that to prevent the great trouble which would arise

arise from turning the waggon round on a rail-road, it would be better to have a check to each of the four wheels; in which case, after the waggon has discharged its load at the place of its destination, the chains F F may be loosened from the shafts, and fastened upon hooks, one of which is shown at K, so as to keep the checks suspended above the road; the iron bar L, which attaches the shafts B to the body of the waggon, is then to be removed, and with the shafts to be placed in a similar manner at M on the other end of the waggon, which now becomes the fore part, the horse drawing it back to be again loaded. Whenever the waggon is ascending, the checks behind the waggon may occasionally be let down, and used as rests to relieve the horse when necessary.

The

The SILVER MEDAL and TEN GUINEAS were this Session voted to Mr. JOSEPH DAVIS, No. 14, Crescent, Kingsland Road, for his Invention of a DAY and NIGHT TELEGRAPH; from whom the following Communications were received.

An explanatory Engraving is annexed, and a Model of the TELEGRAPH is preserved in the Society's Repository.

SIR,

I TAKE the liberty of troubling you with a model of a Day and Night Telegraph of my own invention, which I shall be obliged by your submitting to the inspection of the gentlemen of the Society of Arts, &c. Permit me to to observe, that the day telegraph works on a superior principle to that at present in use; it is not so liable to get out

out of order, and at the same time facilitates the correspondence. The night telegraph can at any time (if out of use) be got ready and fixed in a few minutes; the principle of this telegraph will admit lights of any description, simple or compound, which are not liable to injury from the weather; the situation in which they are placed with the line of direction, (in my opinion) makes the night telegraph equally useful with the day telegraph. The line of direction which I have applied has several new properties peculiarly advantageous to night telegraphs.

I am, Sir,

Your obedient humble servant,

JOSEPH DAVIS.

No. 14, *Crescent, Kingsland Road,*
13*th March*, 1805.

To CHARLES TAYLOR, Esq.

Reference

Mr. I. Davis's Day and Night Telegraph.

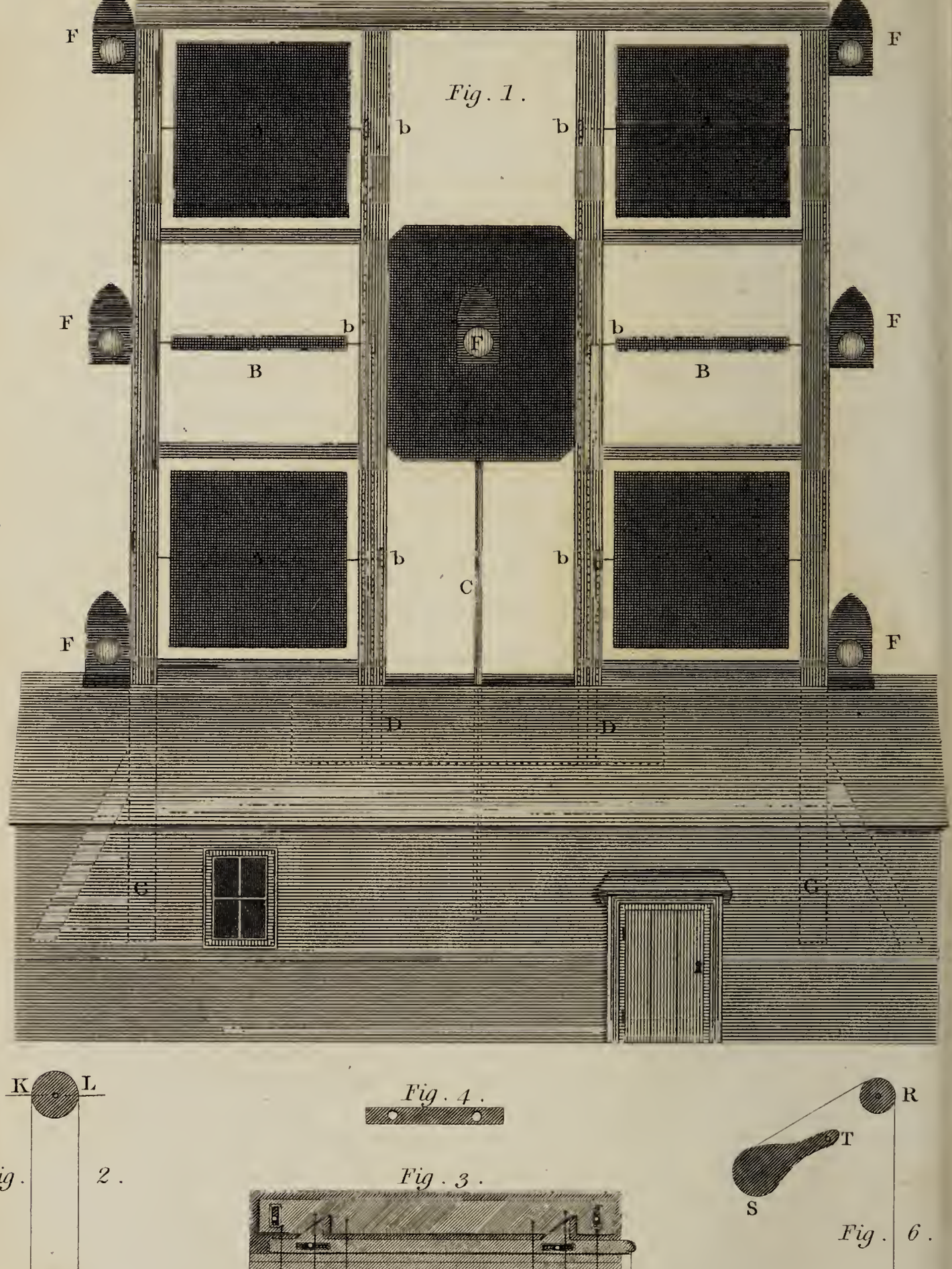


Fig. 2.

Fig. 4.

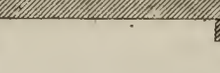
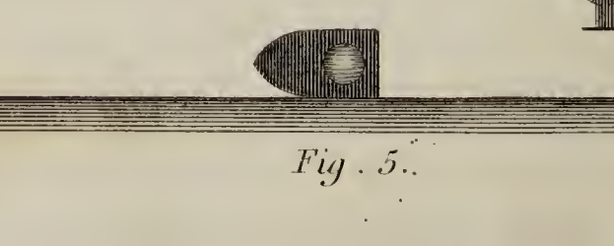


Fig. 3.



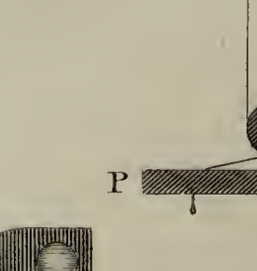


Fig. 6.

Fig. 5.

S. Porter sc

Reference to Mr. J. Davis's Telegraph, Plate IX.

Fig. 1. A view of the telegraph, with both the day and night parts attached thereto.

The centre shutter is represented in its vertical situation.

A A A A, Represent the four corner shutters in a similar position.

B B. The other two shutters lying horizontally.

C. A pole or rod, about one inch and a quarter diameter, to raise or lower the centre shutter.

Three cords on each side of the centre shutter work in grooves within the uprights, over small wheels or pullies *b b b b b b*, fixed upon the axis of each shutter.

F. The coloured lamp, fixed in the middle of the centre shutter.

F F F F F F. The six other lamps, three on each side.

G G. The inside frame-work of the uprights shown by dotted lines, and

A a supposed

supposed to be firmly fixed in the ground and supported by braces.

Fig. 2. H, Shows one of the wooden sliders, by which the shutter is moved; a cord fixed to the point H passes under the pulley I, and over the pulley K, fixed on the axis of each shutter; at the part L it is wedged into the pulley, so that it cannot pass without moving the shutter; M is a spring to give a proper tension to the cord, if affected by the weather.

Fig. 3, Represents the slides 1, 2, 3, 4, 5, 6, which work the shutters, with bolts to fix and unfix them. By means of the pedal N, the whole of the shutters may be bolted or unbolted at pleasure.

Fig. 4, Is a brass plate to receive the bolts last mentioned.

Fig. 5, Represents three of the side lamps, taken off and laid down; they are fixed to a slider, which

runs

runs in a dove-tailed groove on the side of the outside supporter.

Fig. 6, Shows the method by which the blinds which cover the lamps are raised or let fall; P, the slider; Q, the lower pulley; R, the upper pulley, over which the cord goes; S, one of the blinds moveable on its centre T; another similar blind is upon the same axis, and rises or falls by the same cord, so that the light of the lamp is shown or excluded at both sides of the telegraph at the same time.

The night telegraph when out of use may be got ready in a few minutes, the lamps or lanterns being screwed to a piece of wood five inches wide, and one inch and a half thick, as shown in *Fig.* 5; which is fixed by sliding up a dove-tailed groove, tapering from top to bottom, which renders them easy to be raised, and perfectly secured by a bolt sliding underneath within the

building. Before the centre lamp F, which is the point or line of direction, is a plano convex, or double convex lens of any focus or diameter, formed hollow so as to admit of being filled with any transparent coloured liquor, to which lens there should be a neck or tube, to admit of the contraction or expansion of the coloured liquor.

The night telegragh has sixty-three changes, without varying the line of direction. The middle shutter of the day telegraph works in grooves on each side; it is raised or lowered by the pole C; if placed in the centre, it forms with the six shutters one hundred and twenty-six changes, and by being raised occasionally on a line with the upper shutters, or drawn down to the line of the lower shutters, will form in the whole two hundred and fifty-two changes. When not in actual work, it is lowered within the house.

FIFTY GUINEAS were this Session voted to Mr. ANDREW FLINT, for his Invention of an expanding BAND WHEEL, to regulate the Velocity of Machinery.

The following COMMUNICATION was received from him; an ENGRAVING of the Machine is hereunto annexed, and a MODEL thereof is preserved in the Society's repository, for the inspection of the public.

SIR,

I HEREWITH send you the models and description of two expanding band-wheels or riggers, for regulating the velocity of machinery, which I hope will meet the approbation of the Society.

I am, Sir,

Your most obedient servant,

ANDREW FLINT.

London, 22d May, 1805.

To CHARLES TAYLOR, Esq.

Description of the Model, Pl. X.

In the usual method of connecting machinery, by a band running over two wheels or riggers; it is obvious that the relative velocity of the wheels is in the inverse ratio of their diameters; and these diameters always remaining the same, no alteration of the velocity can be obtained, but by a corresponding variation in that of the moving power applied.

To enable the artizan to regulate the velocity of his machinery at pleasure, the moving power remaining as before, or to retain the same motion, with an alteration in that of the applied force, is the purpose of the invention, the models of which are now laid before the Society. In this model are shown two methods of attaining this desirable object; in both, the periphery of the band-wheel is divided into any convenient number of parts, according to the

Fig. 3.

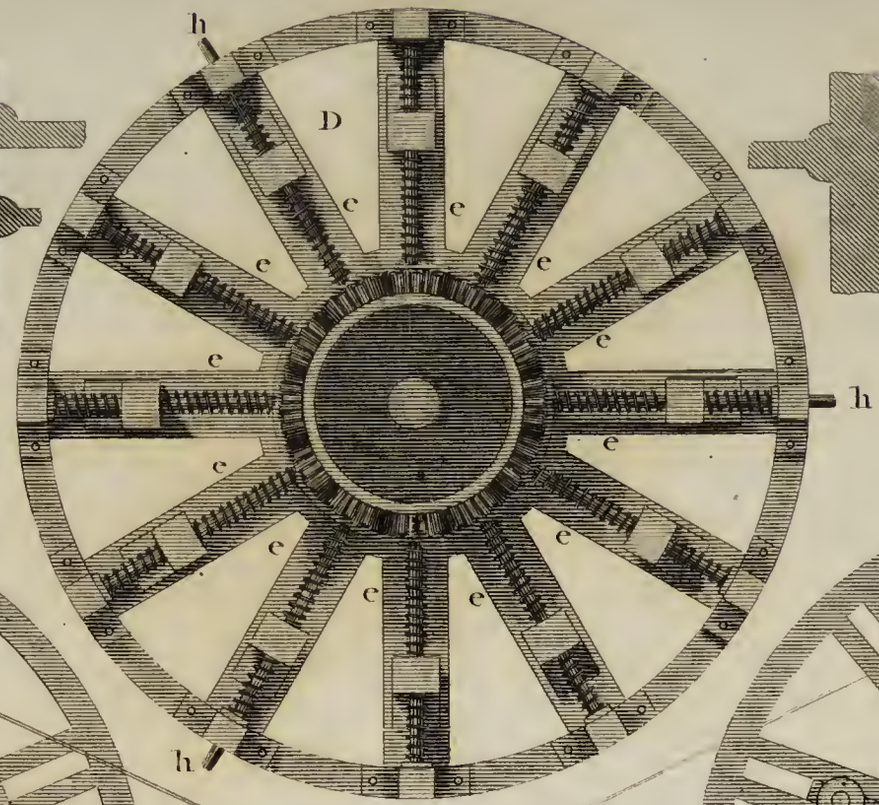


Fig. 4.

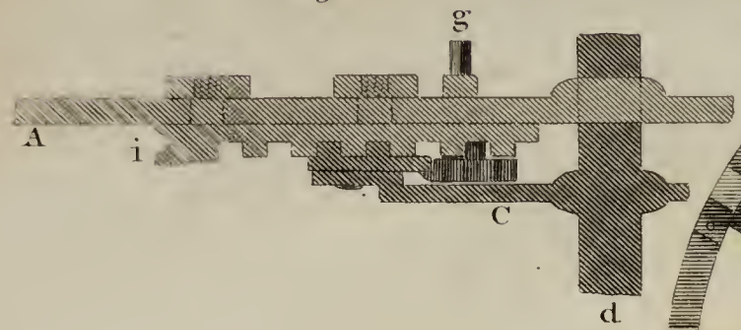


Fig. 5.

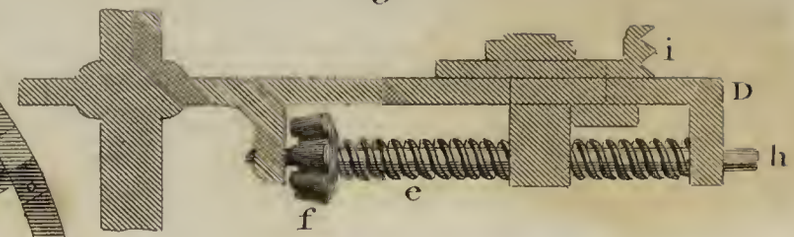


Fig. 1.

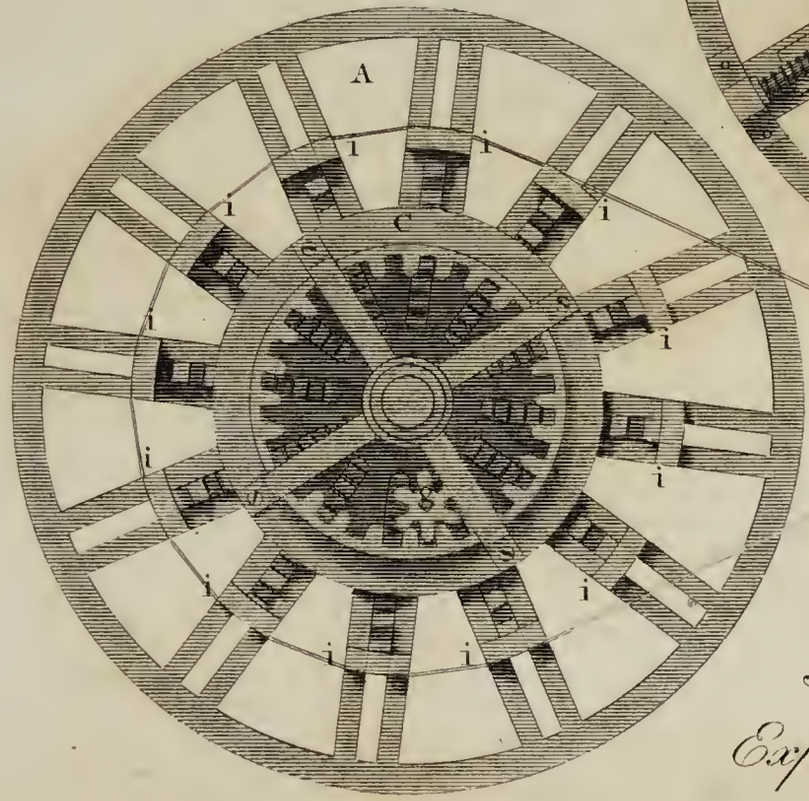
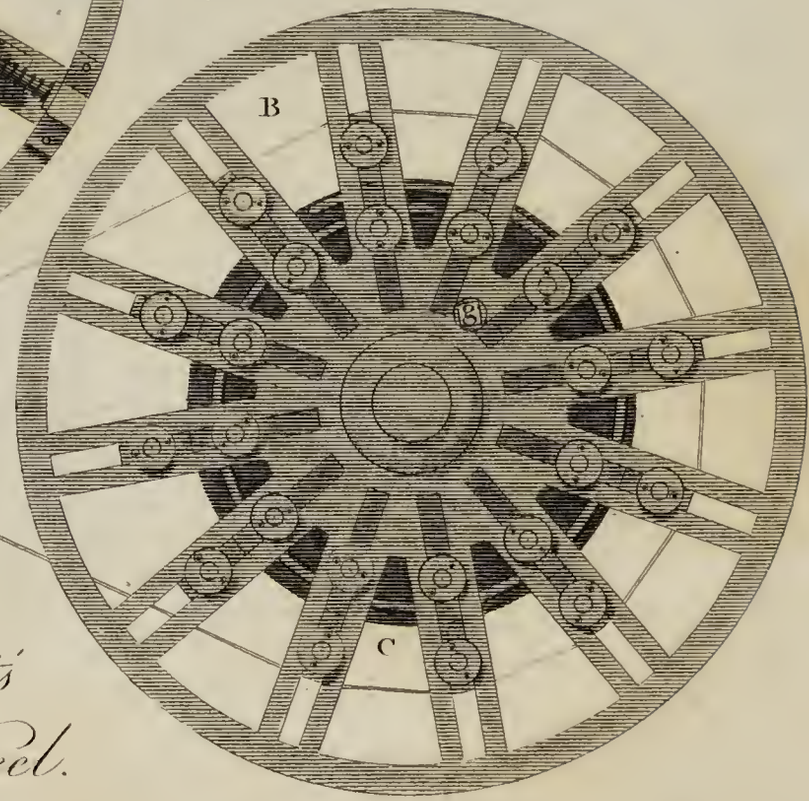


Fig. 2.



Mr. Andrew Flint's Expanding Band Wheel.

C. Varley del.

S. Porter sc.

the size of the wheels, (in this case twelve) which may be placed at any given distance from the centre of the wheel, (within the limits of the machinery) and thus, by enlarging the circumference of one band-wheel, while the other is equally diminished, to alter the relative velocity of each at will. These parts of the periphery, which I term V's, and are marked by the letters *i i i i i*, &c. are confined to move in grooves, cut in the large wheels A and B, *Fig.* I. and II. in the direction of their radii, and are moved by a spiral thread in the small wheel C, which thread takes in the teeth of the racks on which the V's are fixed. A part of the shaft on which the wheel A is fixed, is made circular, to admit the small wheel C to turn round independently of the other, and thus to extend or contract the racks and V's in *Fig.* III.—*Fig.* IV. is a section of part of the rigger, in which the letters refer to the same parts as in *Fig.* I. and II.

In the wheel D, the same effect is produced by the screws *e*, *e*, &c. which are made alternately right and left handed, and turn with equal motions, by means of the equal bevil-wheels *f*, *f*, &c. fixed at their ends near the axis of the wheel. *Fig.* V. is a section of the same.

The wheel C, *Fig.* I. and II. is moved round the shaft *d* by the pinion *g*, on the axis of which is fitted occasionally a winch. The screws of the wheel D, *Fig.* III. may be also turned, by means of a winch applied to their projecting heads *h*, *h*, *h*. It is proper to notice that the number of the screws must always be equal.

ANDREW FLINT.

Goswell-street, London.

The

Fig. 1.

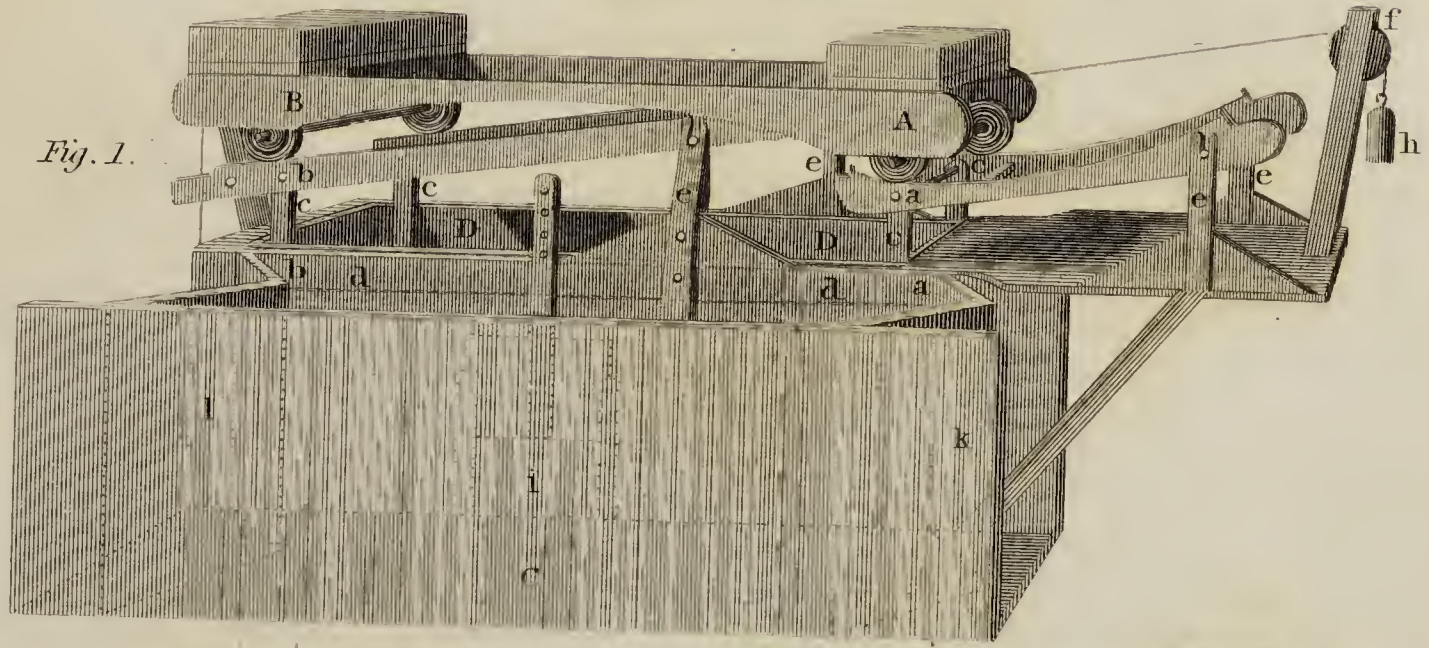


Fig. 2.

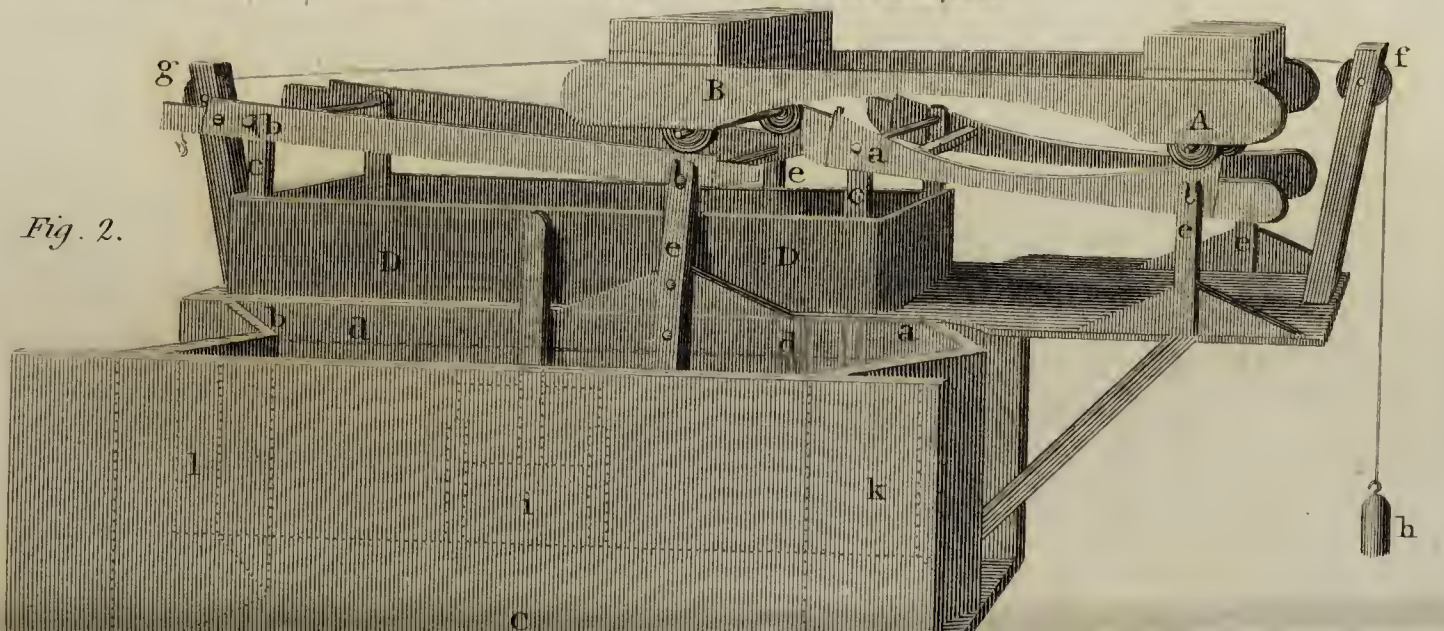
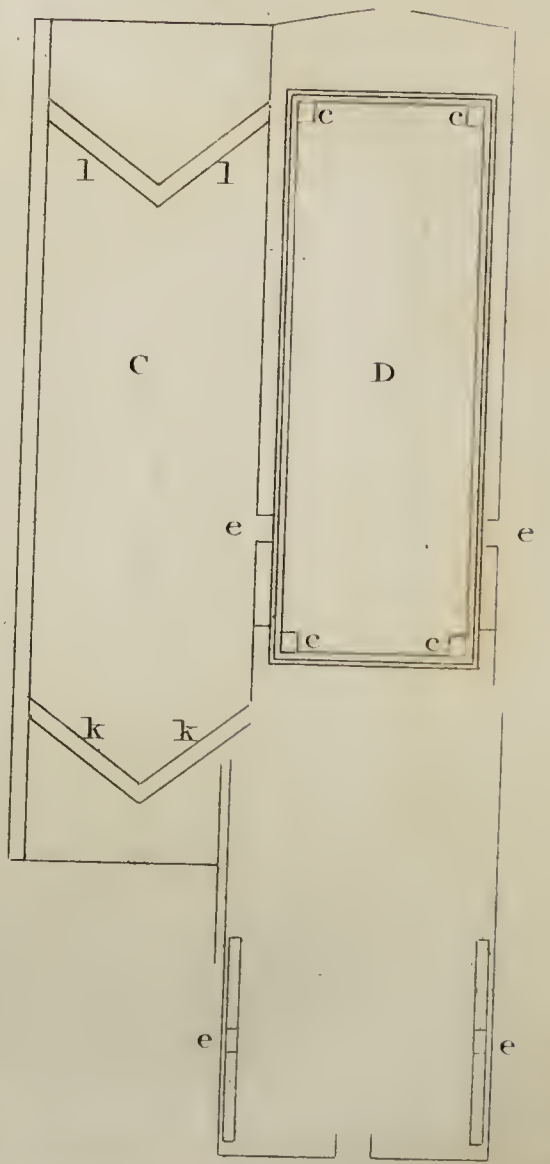


Fig. 3.



The SILVER MEDAL of the Society and TEN GUINEAS were this Session voted to Mr. ROBERT SALMON, of Woburn, for an Improvement in CANAL LOCKS, and for preventing a waste of water.

The following COMMUNICATION was received from him; an ENGRAVING is hereunto annexed, and a MODEL is preserved in the Society's Repository.

SIR,

FOR the inspection of the Society of Arts, &c. I have forwarded my model, and you herewith receive enclosed a description thereof. The novelty of this mode of bringing into action a considerable force, will I hope appear; and I beg leave to observe, that besides the principle being applicable to locks, it will apply to many other

other uses, where a lift or descent is required. It may also be right to observe, that the curve may be so constructed, as to counteract the inclination of the load on the plane, under any irregular operation; and being so constructed, the load will in all cases be nearly as easily moved as if always running on a level surface.

I am, Sir,

Your most obedient humble servant,

ROBERT SALMON.

Woburn, April 23d, 1805.

CHARLES TAYLOR, Esq.

Description of Mr. R. Salmon's Model, for elevating and depressing Water, applicable to the use of Canal Locks, and for preventing the usual waste of water therein, with directions for working the same.—Plate XI. *Fig.* 1, 2, 3.

In *Plate* XI. C is supposed to represent a canal lock of the common construction,

construction, whose lower gates *i*, *i*, open towards or into the lock, and its upper gates *k*, *k*, open towards the upper or higher level of the canal; D is a hollow caisson, or water-tight chest, which is fitted to a walled chamber or side-lock, so as to move freely up and down therein; *i* is an opening, which forms a connection between the lock and the caisson-chamber, and which can be closed by a shuttle fitted thereto, when required. Four standards, *e*, *e*, *e*, *e*, are firmly fixed on the ground and walls of the lock and chamber; and four posts, *c*, *c*, *c*, *c*, are fixed in the four corners of the caisson; on each alternate pair of these standards and posts the frames *a* and *b* rest, as on so many fulcrums, or moveable joints; the frame *b* (*Fig.* 1 and 2) has two straight parallel bars of thin iron fixed thereto, and standing up above the same; the frame *a* has two similar bars affixed to it, except that the top edges of these are hollowed

lowed into a curve, as shown in the figures. B A, is a carriage loaded with two heavy leaden weights, and resting on four low brass wheels, having grooves in their circumferences like sash pullies, to receive the iron bars upon the frames *b* and *a*, so that the carriage can be drawn along upon them; the distance of the axles of their wheels is such, that when the wheels at B rest on the frame over two of the posts *c*, *c*, the wheels at A shall at the same time rest over the other two posts *c*, *c*, as shown in *Fig.* 1; and when the wheels at B rest over two of the standards *c*, *e*, the wheels at A shall at the same time rest over the other two standards *e*, *e*, in *Fig.* 2. In order to work the model, the carriage must be brought into the position shown in *Fig.* 1, and this can readily be done by stops, which are provided in the proper places on the curved bars, for preventing the wheels from rolling too far; as much water must

must then be poured into the lock C, as will fill it exactly to the black line *d*, *d*, withinside the same; and if the table on which the model stands, be not level, small wedges or chips must be put under the model where necessary, until the surface of the water exactly corresponds, all round the lock, with the top water-mark or line above-mentioned; it must likewise be observed, to place the model across the table, so that the weight *h*, when hung over the pulley *f* or *g*, may be at liberty to descend. Then hang the two-pound weight *h*, *Fig.* 1, by the line over the pulley *f*, at the upper end of the lock; and the carriage, or load B, A, will be drawn forwards into the position shown at *Fig.* 2, and the water in the lock C will pass through the shuttle, to buoy up the caisson D, and its surface in the lock will descend to the lower level. Again, by shifting the weight to the lower end *g*, the load will again be brought

brought back, the caisson depressed, and the water forced through the shuttle, again raised to the higher level *d*, *d*, in the lock, as in *Fig.* 1.

Hence it is evident that the water in the lock, with or without a boat therein, may be raised or lowered, by the application of any force to move the carriage or load, horizontally on wheels. That when it is intended to pass a boat from the upper to the lower canal, the water in the lock is raised to the top water-level *d*, *d*; the upper gates *k*, *k*, are then readily opened, and the boat floated into the lock; this done, and these gates shut, the water and boat, by withdrawing the load from the caisson, is lowered to the lower level of the canal. The lower gates *i*, *i*, are then opened, and the boat floated from the lock to the lower canal. In this operation of lowering a boat, it is evident, that so far from there being a waste of water, a weight of water equal to the boat

boat and its load is raised from the lower to the upper canal; for when the boat at the upper level first enters the lock, its own weight of water is displaced, and forced into the upper canal. And again, when it is floated into the lower canal, as much is again from that canal displaced, and forced into the lock.

On the same principle that water is gained by a descending boat, as above described, it will be observed, that no waste ensues in an alternate passage; and that in an ascending passage, a loss of water equal to the boat and its load only takes place.

It should be understood, that as canals are sometimes more or less full of water, locks on this principle must be constructed to raise and depress, to the greatest extremes that ever happen, from the highest high-water, to the lowest low-water mark, and that being so constructed, they will apply to any intermediate

termediate heights; the curved plane *a* being formed, to adjust and counterbalance the inclination of the wheels on the other plane *b*, thereby maintaining an equilibrium, at any intermediate height, which the water in the canal may happen to be at.

Having described its manner of operating, I shall explain and compare cause and effect; for which purpose it may be requisite, first to state, that the load of the carriage B, A, is fifty-six pounds, which weight, when advanced, presses directly over the parts *c*, *c*, *c*, *c*, with all its gravity bearing on the caisson; but when the load is drawn forwards, it rests entirely on the fixed standards *e*, *e*, *e*, *e*, and by this change the whole effect is produced.

Now, if the model be set properly to work, it will be found, that a two-pound weight suspended over the pulley at either end, will put the carriage in motion, and thereby raise or depress the water in the lock, and that to do so, the

the two-pound weight will descend sixteen inches. Hence, two pounds descending sixteen inches, may be denoted the cause or power to produce the effect. Farther, it follows, that this two-pound weight descending sixteen inches produces the same operation as fifty-six pounds laid in the caisson would perform, and this sinking of the caisson D may be denoted the direct effect produced by the two-pound weight. The indirect and requisite effect being that of depressing or elevating the water in the lock C, and the comparison thereon will stand thus: the surface of a body of water, of an area of twenty-four inches by ten, is raised about four inches and a half by the power of two pounds descending sixteen inches; and, *vice versa*, by reversing the power, the water is again depressed.

The shuttle *i*, between the lock and the caisson chamber, will regulate the

time of the ascent or descent of the caisson.

R. SALMON.

Woburn, 23d April, 1805.

CHARLES TAYLOR, Esq.

SIR,

IN reading over the copy of the paper which I hastily drew up, and sent with my model, I observe that I omitted making any remarks on its applicability, improvements to be made in the carriage to facilitate the moving of the load, and on the different other ways, besides the one shown in the model, by which it may be put in action.

It will readily occur to every engineer, that this sort of lock is not confined to the particular shape of the model, or to any particular form. The caisson chamber may be placed endwise to the lock; may be of any shape, and

and placed at a nearer or further distance, as may be required.

On comparing the length and movements of the frames in the model, with what may be required in practice, it will appear that the length of timbers at large will not be such but that strength sufficient may be obtained for any load. It is also evident, that, although the frames consist of only two bearers in the model, yet, at large, any number may be introduced, parallel with each other, and as many wheels as bearers.

In this operation the weight of the carriage itself contributes towards the effect, which in common cases is otherwise, as generally there is an objection to the great weight required to make a carriage sufficiently strong for any extraordinary purpose; and there is no doubt but, by an improvement of the carriage, it may be made to require much less than the power used in the present

model. The mode I should pursue would be, to make the load in the wheels themselves, that is to say, the necessary load to produce the effect should be two solid iron cylinders, running on as many bearers as are requisite, and to have a frame or carriage for the purpose only of connecting the cylinders; by these means, the strength and friction of the axletrees would be reduced very much, and the means required then to perform the operation would be only to put the body in motion, and to overcome any little obstacle or irregularity, that the peripheries of the cylinders would meet with in their progress.

The advantage of rollers over wheels has been admitted, even where the peripheries of the cylinders were in contact with the incumbent weight resting on the top of them, as well as with the supporting plane below; but, in the case above suggested, they have more advantage,

vantage, being only in contact with the upholding frames.

With respect to its operation, if any objections should be found to the great animal power that would at large be required, it will occur, that various other means may be used to put the carriage or load in motion; some without any loss of water, and others with a trifling loss, compared with what the lock holds. Thus, when the caisson is up, if, by a cock, a portion of water be let into it, the equilibrium will be destroyed, the caisson will sink, and the water in the lock be raised. Again, if by a pump, or other means, the water be returned from the caisson to the lock, the caisson will rise, and the load of itself recede, and this would be without waste of water. To put it in motion with a certain portion of waste, it is presumed, different ways may be found, as the introduction of a portion of water from the upper canal to the lock,

or the discharging of it from the lock to the lower level, these would with management occasion the caisson to rise or fall; or, if a part of the load were made to shift farther from, or nearer to the fixed standards *e e e e*, it would thereby cause the action required, and perform the operation; and it is probable, that a better way than any here suggested would arise, should the thing be put in practice.

I am, Sir,

Your obedient humble servant,

ROBERT SALMON.

Woburn, May 4th, 1805.

CHARLES TAYLOR, Esq.

The

The SILVER MEDAL of the Society was this Session voted to Mr. J. J. HAWKINS, of Dalby Terrace, City Road, for his Invention of a MACHINE for CUTTING PAPER and the EDGES of BOOKS.

The following COMMUNICATION was received from him; an explanatory ENGRAVING is hereunto annexed, and a MODEL is preserved in the Society's Repository.

SIR,

THE Society for the Encouragement of Arts, &c. having done me the honour to elect me a member of their body, I feel myself bound to be active in endeavouring to promote the objects of the Institution; and beg leave to present, by way of earnest, a model of a press, in which books or paper may be cut on the three edges at one fixing.

This plan occurred to me about four years ago, when I had two or three presses made, which were used by some book-binders in Philadelphia, and found to save much time, besides ensuring the books to be of one size.

The model is not made to any scale, because the size must vary with that of the books to be cut.

I am, Sir,

Your humble servant,

JOHN J. HAWKINS.

London, April 24th, 1805.

TO CHARLES TAYLOR, Esq.

SIR,

THE object of this improvement is, to cut the edges of books on three sides at one fixing in the press: to do this, it is necessary that the book be placed at one end, and a support given to the plough beyond the part cut; there is therefore at each corner, a block moveable

moveable on a centre, so as to elongate alternately the side or end of the press.

The press is as wide as the intended length of the book.

At a distance from the end of the press, equal to the required width of the book, is a stop, made somewhat like two combs, one fastened on each side, the teeth of one going into the interstices of the other, so that it may effectually prevent the book falling too low, whether the press is open little or much.

In the common press, the book is put in the middle, and there is a screw at each end to force the press together; but in this press, the book being put at one end, there is a screw about the middle to force the press together, and another screw at the lower end to force it open, and consequently press the book tighter, exactly on the principles of cabinet-makers hand-screws.

Reference

Reference to the Engraving, Plate XII. *Fig.* 1, 2, 3, 4.

Fig. 1 and 2. Two geometrical views of the press.

Fig. 3 and 4. Two perspective views of the same, as placed on its supports in the box which receives the cuttings. The side of the box is represented as taken away, in order to show the parts more distinctly. *Fig.* 3 shows the position of the press, when the front of the book is to be cut, and *Fig.* 4, while the ends are cutting.

N.B. The letters of reference are the same in all the *Figures.*

A. The press.

a. The cutting box.

b b. The elongating blocks turning on their centres *(c)*

d. The screw which forces the press together.

e. The screw which forces the lower ends of the press asunder, and consequently presses the book tighter.

f. A

f. A piece of board put into the press with the book, to keep it firm against the knife.

g. The comb-like stop.

hh. Bars fixed across the cutting box, to support the press while the top or bottom of the book is cut.

i i. Bars to support the press while the front of the book is cut. In this position, there is a bar *(k)* to keep the press steady, which is taken out when the position *Fig.* 4 is in use.

l l. Pieces of board with notches in them, fastened to the box, to receive the bars.

m. Groove for the plough to work in.

It is evident from the positions of the press, that the plough must be worked on an inclined plane; but this, instead of an objection, is a considerable advantage, because the workman has much more power in that direction, than on a level.

The press requiring to be turned round to cut the top and bottom of the book,

book, the plough must be worked left as well as right handed, but this is acquired by a few minutes practice.

The same plough is used as with the common press.

J. J. HAWKINS.

Dalby Terrace, City Road,
May 29th, 1805.

CHARLES TAYLOR, Esq.

Mr. H. Ward's new striking Movement in a Clock.

Fig. 5.

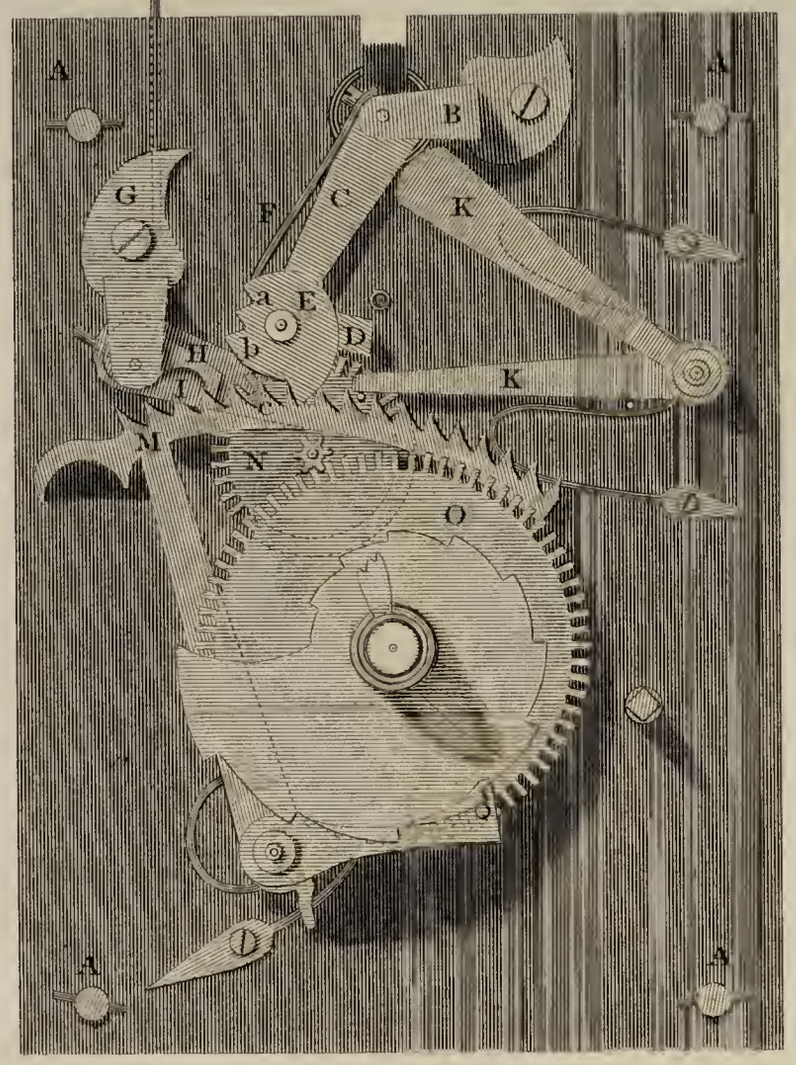


Fig. 2.

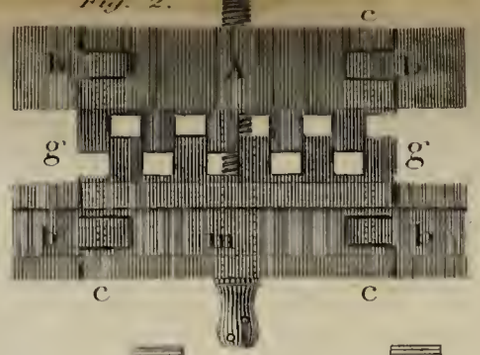
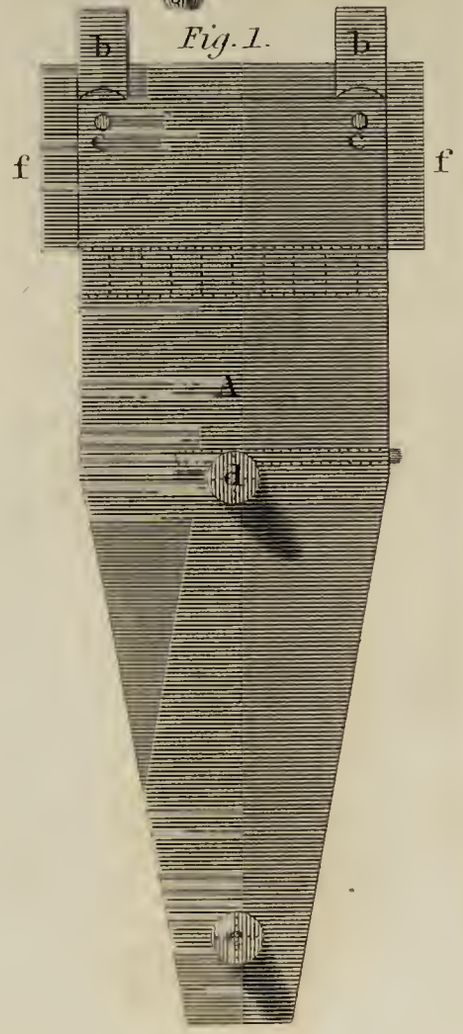


Fig. 1.



Mr. Hawkins' Machine for cutting the Edges of Books.

Fig. 3.

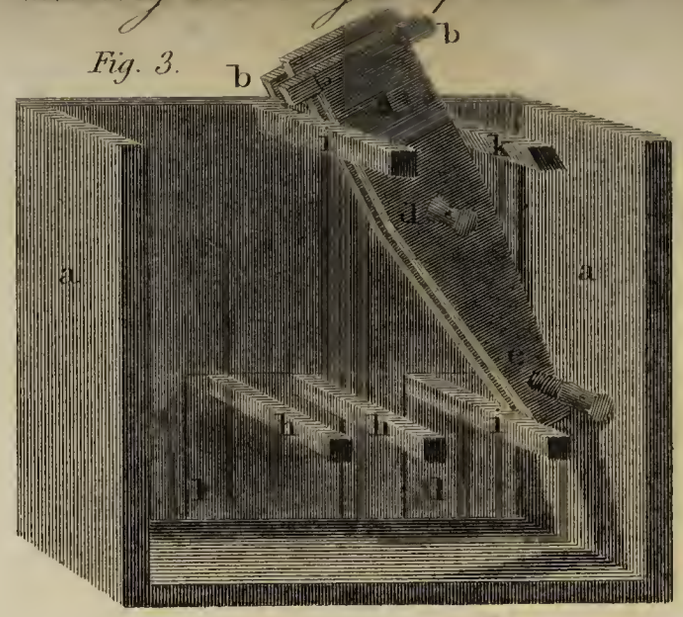
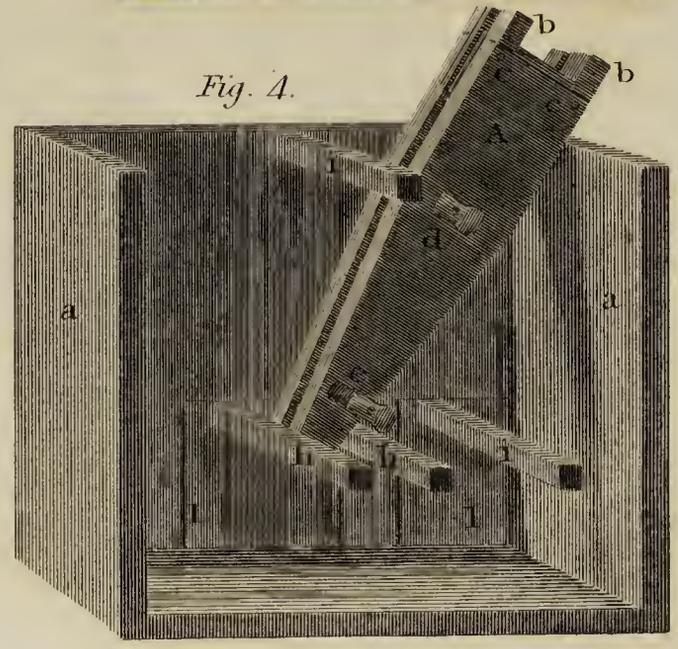


Fig. 4.



C. Varley del

S. Porter sculp.

FIFTEEN GUINEAS were this Session voted to Mr. HENRY WARD, of Blandford, in Dorsetshire, for a new STRIKING CLOCK MOVEMENT.

The following COMMUNICATION was received from him; an explanatory ENGRAVING is hereunto annexed, and a CLOCK upon this principle is preserved in the Society's House.

SIR,

THE clock sent herewith is the invention of Mr. Henry Ward, of Blandford, in Dorsetshire. He has requested me to lay it before the Society for the Encouragement of Arts, Manufactures, and Commerce.

He hopes they will be pleased to examine the clock he has sent, and that they will think his invention worthy of some mark of their approbation,

I am, Sir,

Your most obedient sevant,

CHARLES SMITH.

Bunhill-Row, Feb. 14th, 1805.

CHARLES TAYLOR, Esq.

Reference to the Engraving, Pl. XII. *Fig.* 5.

Description of an Eight-day Clock, with an improved Striking Part, by Mr. Henry Ward, of Blandford, Dorsetshire.

The striking part of this clock is so far simplified, that the whole train of wheels used in common clocks, together with the barrel and weight, are entirely superseded.

The power necessary for raising the hammer is obtained from the pendulum.

A A A A, represent the front side of the frame. B, a cock in which rests the pivot of the pallet arbor. C, a brass arm firmly fixed on the same. D, the gathering pallet, and E, a thin plate of brass, both rivetted on the same collet, which turns on a small stud fixed in the arm C; this brass plate has two notches

in

in it, at *a b*, in which acts a slender spring F, fastened to the collet of the arm C, by a small screw, and serves to keep the gathering pallet in its proper position. G, the cock of the hammer-bar. H, the hammer-tail, which acts also as a hook in the teeth of the rack. I, a brass arm, or rather a lever, which lies behind the minute-wheel N, and is fixed with the hammer-tail to the hammer-bar by means of a pin. K, the flirt. M, the rack. N, the minute wheel. O, the hour wheel. The bridge and snail are the same as in a common clock.

The operation of this work is as follows. A pin is fixed in the back of the minute wheel N, and as it revolves, raises the lever I, by which the hammer-tail H is lifted out of the rack, the rack is then at liberty to fall; the lever I, by bearing against the pin, returns gradually, and prevents the hammer from striking the bell.

Before

Before the pin has quitted the lever I, another pin in the front side of the same wheel begins to lift the flirt; when raised to a sufficient height, it is let go by the pin, and falls on the gathering pallet D, which forces it into the rack; it is prevented from rising out of the rack by the spring F, having got into the notch *b* of the brass plate E; the pallet immediately acts on the rack; for, as the arm C moves from left to right, it lays hold of a tooth, and carries it along with it by means of the *vis inertiæ* of the pendulum, at the same time the hammer-tail is raised by another tooth of the rack, and on quitting it the hammer strikes the bell; when the arm C returns with the gathering pallet from right to left, the rack is prevented from returning with it by the tooth resting against the end of the hammer-tail, the pallet is then carried over another tooth, and at the next vibration moves the rack and hammer-tail as before; thus they continue

continue to act alternately on each other till the rack is up, and the clock makes one stroke regularly at every other vibration.

Now, in order to disengage the gathering pallet, there is a pin fixed in the rack at *c*, and as soon as the last tooth of the rack has got past the hammer-tail, the shoulder of the brass plate E, which is rivetted to the pallet, strikes against the pin *c*, and lifts it out of the rack, the spring F jumps into the notch *a*, and prevents it from returning; thus it remains detached, and the pendulum continues to vibrate without any obstruction. The ball of the pendulum weighs about eight pounds thirteen ounces; and the weight twenty-four pounds. The clock has a dead scapement.

The objection that may perhaps be made to this clock is, that the striking part disturbs the isochronism of the pendulum; but whoever will take the trouble to try it against another pendulum, of the same length, both before

and after it has struck, will find no sensible alteration; and even if that were the case, the irregularities would be periodical, and return to themselves every twelve hours.

The advantages which I conceive this clock to have over a common clock, are as follows.

First.—That it is not attended with that disagreeable roaring which is frequently heard in the wheels and pinions of others, and particularly the fly pivots when in want of oil.

Second.—That the interval between the strokes is uniformly the same: the case is very different in other clocks, for as they get foul they always strike slower, and more so still when the weather is cold.

Third.—That in consequence of its simplicity, it is not liable to be out of repair.

Fourth.—That it can be manufactured for considerably less expense.

Henry Ward.

TWENTY GUINEAS were this Session given to Mr. JOHN ANTIS, of Fulneck, near Leeds, for a DETACHED ESCAPEMENT of a PENDULUM CLOCK; from whom the following ACCOUNTS were received.

A MODEL thereof, attached to a REMONTOIRE, invented and presented by Mr. ANTIS, is placed in the Society's Repository, for the inspection of the public.

SIR,

I HEREWITH send you the detached escapement for clocks, which I formerly mentioned to you. Since I wrote to you, I have made some trifling alterations in the small piece which locks and unlocks the wheel. You will find that this is done with so little resistance, that the mere weight of the anchor is more than sufficient

ficient to keep it going if once set in motion. I have inserted it in a small clock of mine, and it is surprising what a difference it made in the pendulum; the same force of the spring will carry one three times as heavy as before, and still the motion will be larger and freer. If I followed the trade of a clock-maker, I would insert a small flat ruby, instead of steel, into the place where the friction of locking and unlocking the wheel is, as likewise into the anchor.

I remain, Sir,

Your obedient servant,

JOHN ANTIS.

Fulneck, Dec. 5th, 1803.

CHARLES TAYLOR, Esq.

SIR,

SIR,

I LATELY mentioned to you, that I hoped soon to send you an invention to equalise the power of the impulse, to a balance or pendulum in chronometers or clocks. I now inform you that I have this day sent it; it is accompanied with a letter, directed to you, containing a full description of the machine. If the same thing has not been done before, it may be of considerable advantage to chronometers used at sea, to determine the longitude; advantages of this kind, if to be found, must be of very great moment. I have found by experience, that an improvement was necessary in the contrivance of my late machine, to lock and unlock the swing-wheel in a clock, which I introduced into my last model; for as the little piece of brass with the slanting piece of steel, which serves to unlock the wheel,

moved near its centre against two broad surfaces, and only fell by its own weight, it performed very well when quite clean; but after a little time an imperceptible roughness formed itself, which prevented it from falling by its own weight in its proper situation, and so it stopped the clock. I did not like to add a small spring to force it, for that, little as it might be, would take power from the impulse; I therefore altered it as you will now see in the model.

In this way it is still lighter than the old one, and turning upon very small pivots it will be free from all former obstructions. It succeeded and stood its trial so very well, that I wished to send a new pattern of it to the Society, and this was the reason why I made use of the same escapement; otherwise, I would rather have made a balance, as my invention was chiefly meant for chronometers, though it will be full as useful for

for astronomical clocks as any others, where accuracy is required. Because, by these means, a spring clock will be as perfect as one which goes by weight, and more so if the latter has no remontoire; because, though free from the friction of the spring, it would not be free from the inaccuracies of the train of the wheels without it.

Being deprived of the opportunity of conversing with scientific persons upon the subject, I might easily be led to think that, which my imagination suggests, to be new, though it may have been practised before. Yet as there still is a possibility that a person in my situation may hit upon something which may have escaped the sagacity of others, I resolved to send the model of it. I have other disadvantages in the place where I reside, viz. I have no person to assist me, but am obliged to execute my thoughts by my own hands only, whether the work be in wood,

steel, or brass, nor can I always find the necessary materials and tools ready. It will be no wonder therefore if skilful workmen may in some cases have reason to find fault with the execution.

I remain, with great regard, Sir,

Your most obedient servant,

JOHN ANTIS.

Fulneck, Nov. 17th, 1804.

CHARLES TAYLOR, Esq.

The

The SILVER MEDAL of the Society was this Session voted to Mr. JOHN ANTIS, of Fulneck, near Leeds, for his improved DOOR LATCHES.

The following COMMUNICATION was received from him; an explanatory ENGRAVING is hereunto annexed, and MODELS of the LATCHES are preserved in the Society's Repository, along with DRAWINGS thereof.

SIR,

I DO not doubt but that you are persuaded of the necessity of having a door-latch superior to, and not so liable to be out of order as those hitherto in use, in the door-locks of dining-rooms, &c. Some time ago, I made an attempt to contrive such a one, which I fixed into a small box by itself; I have now tried it for some years in my own

own house, during which time I never found occasion to clean or to oil it. I at that time thought there would be a difficulty to introduce it into a mortise lock, in such a manner as to place the nobs and the key-hole symmetrically. That difficulty I have now overcome, and take the liberty to send you a pattern, for your inspection.

My object has been to contrive a simple latch, as much as possible without friction, not more expensive than those hitherto in use, and capable of moving smoothly and easily without the necessity of cleaning and oiling, as long as the metal will last of which it is made. How far I have succeeded, I leave to the decision of the Society.

I am, Sir,

Your humble servant,

JOHN ANTIS.

Fulneck, April 3d, 1804.

To CHARLES TAYLOR, Esq.

Reference

Reference to Mr. Antis's Improved Door Latch, Plate XIII. *Fig.* 1.

A, Shows the hole for the handle, which moves the follower and latch.

B. The follower which draws back the latch, on turning the handle either way.

C. The latch.

D. The longitudinal spring, which throws out the catch of the latch when the hand is withdrawn.

E. The small bolt, to secure the door internally.

F. The key-hole, the bolt of the lock of which is not shown, being placed above the key-hole.

THIRTY GUINEAS were this Session voted to Mr. J. WATKINS, No. 9, Giltspur-street, West Smithfield, for an Improvement in TIME-KEEPERS; from whom the following COMMUNICATIONS were received.

An ENGRAVING is hereunto annexed, and a MODEL of this Invention is preserved in the Repository of the Society.

SIR,

I HAVE taken the liberty of sending you, for the Society's inspection, a model of an improvement for constructing time-keepers, or for ascertaining the longitude at sea.

The principle of the improvement is to reduce friction, it being the greatest enemy to machinery in general, but more especially to such as is intended for measuring time; for, while my plan retains every advantage of the best similar improvements hitherto made, the friction of the most essential parts is reduced full

one

one half, consequently better performance may be expected, and the machines be more durable.

I have sent a sketch of the dip or depth that rollers of the same size take into a wheel, by placing them in different positions and describing the same angles.

I have by me, and belonging to the model I have sent, other wheels of the most eminent makers; such as Arnold's famous epicycloid wheel, and Mr. Earnshaw's; and by applying them to the machine, my plan is clearly proved to be preferable to any other.

If any explanation is needful, I shall be proud of giving it, to the best of my abilities; and remain, Sir,

Your most obedient
and very humble servant,
J. WATKINS.

No. 9, Giltspur-street, West Smithfield,
October 9th, 1804.

To Mr. CHARLES TAYLOR,
Secretary to the SOCIETY of ARTS, &c.

SIR,

SIR,

NOT having sent you an explanatory or descriptive account of the properties of my model, for an improved detached escapement to reduce the friction in time-keepers for ascertaining the longitude at sea, I now take the liberty, for the information of the Society, to send you my opinion of the advantages which I think it possesses over any that have hitherto been made.

The good performance of time-keepers entirely depends on three things, viz. the escapement, balance, and pendulum-spring; and I am convinced, from the experience I have had in time-keepers, that a considerable share of the trouble attending the adjustment of them in different positions, arises from the general mistaken judgment in giving the impulse to the balance, also from not thoroughly understanding the properties of the pendulum-spring. I am, Sir,

Your humble servant,

March 6th, 1805. J. WATKINS.

CHARLES TAYLOR, Esq.

Observations

Observations on an improved detached Escapement for Time-keepers for ascertaining the longitude at sea, on a principle to reduce friction.

The good performance of time-keepers for ascertaining the longitude, entirely depends on the regular and uniform vibrations of the balance, which likewise depends on two particular parts of the machine, viz. that which is called the escapement, or the parts immediately connected with the balance to give it motion; and a proper compensation part to regulate itself in different climates; which two are the only parts now worth attention: for, although it must be acknowledged, that time-keepers have of late been brought to very great perfection, yet I think it must be admitted, that they are susceptible of still greater improvement; and, considering the amazing service they have rendered to navigation, every possible encouragement

couragement ought to be given to render them still more serviceable.

The escapement is composed of two distinct parts of action. First, that which the wheel locks, or rests upon, while the balance is in motion; and, secondly, that which gives the impulse to the balance after it is unlocked: and those that are made with the least friction are undoubtedly the best.

The contrivance of locking the wheel on a spring, if properly made, is I think as perfect as human invention can produce; but the mode of giving motion to the balance, I by no means think is so: for when you compare the manner in which the balance of a watch is kept in motion, with the pendulum of a clock, you must give the preference to the latter. The former, moving on opposite centres, as soon as they come in contact, oppose each other, till they come into a straight line, and in leaving each other occasion considerable friction up

the

the side of the tooth, which action not according with the motion of the balance, greatly retards its progress.

The manner in which the pendulum of a clock is kept in motion is very different; for as soon as the wheel is unlocked, it receives the impulse from what is called a crutch, which being suspended on the same parallel of suspension, describes exactly the same circle, and consequently there cannot be the smallest friction whatever. After many and various trials which I have made to produce the same principle in watches as is in clocks, I found I could not give the impulse from its own centre without introducing other pieces which would counteract the good effect derived therefrom; nevertheless I was determined to approach as near to it as possible, and to employ no more parts to produce the effect, than are used in those of the common construction.

In order to do this, I made a horizontal contrate wheel, and cut teeth on the uppermost rim of it; I introduced a piece of brass inside it, just free of its bottom, on which I placed, half-way between the extremities and centre of the wheel, the axis of the balance, on which I put a round piece of steel with a notch in it, called the impulse pallet, and nearly half the size of the wheel's diameter. After the wheel is unlocked in the usual way, with a spring, the pallet receives a tooth on the point of the notch, which forces it round in a circular direction nearly corresponding with its own; consequently, there cannot be so much friction, as the teeth do not take above half the usual depth into the impulse-pallet, in which case jewelling will be quite unnecessary; the machines must last longer, and as good performance depends on the uniform motion of the balance, there is not the smallest doubt but, if justice is done

done in executing the other parts of this escapement, and a proper compensation for heat and cold, they will perform more accurately than any that have been hitherto invented; but in case any doubt should arise on my plan of placing the impulse-pallet in the midway, between the extremities of the wheel and its centre, I beg leave to offer this single proposition, the propriety of which will not admit of the smallest doubt, viz. If it be perfection to give motion to a body acting on pivots from its own centre; the nearer you approach to that centre, the less friction there will be.

J. WATKINS.

Reference to the Engraving of Mr. Watkins's Improvement in Time-keepers, Plate XIII. *Fig.* 2, 3, 4.

Fig. 2. A perspective view.

A. The circular frame of the machinery.

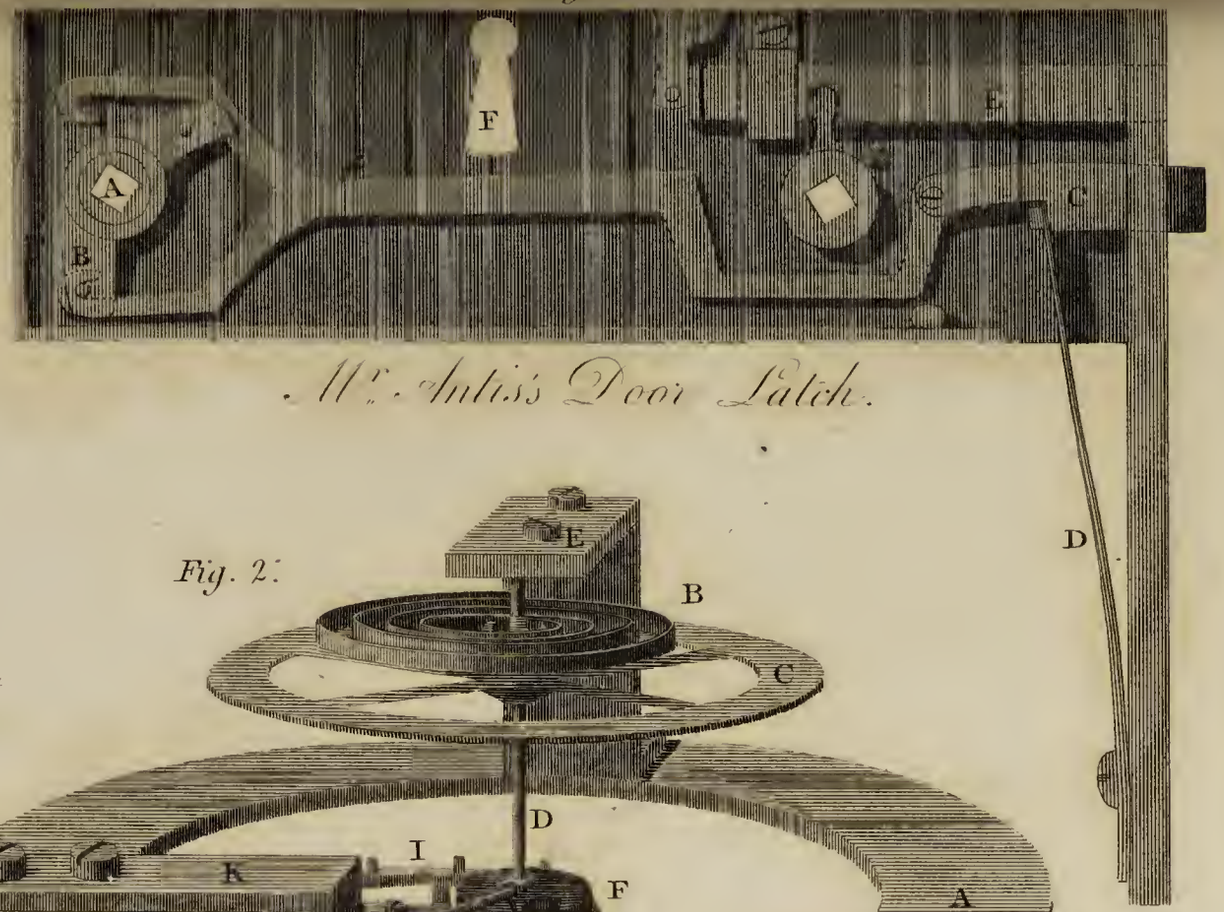
B. The pendulum-spring.
C. The balance.
D. The axis.
E. The cock in which the upper pivot of the axis runs.
F. The impelling pallet, on the axis of which is a small unlocking pallet.
G. The detent and unlocking spring.
H. The axis of the scape-wheel, supported by a cock below it.
I. The scape-wheel.
K. The cock which supports the lower axis of the balance and scape-wheel.
L. The screw for adjusting the locking of the wheel.

Fig. 3. A bird's-eye view.

A. Part of the circular frame of the machinery.
C. The balance.
M. The small unlocking pallet, above the impelling pallet F.
G. The detent and unlocking spring.
I. The scape-wheel.

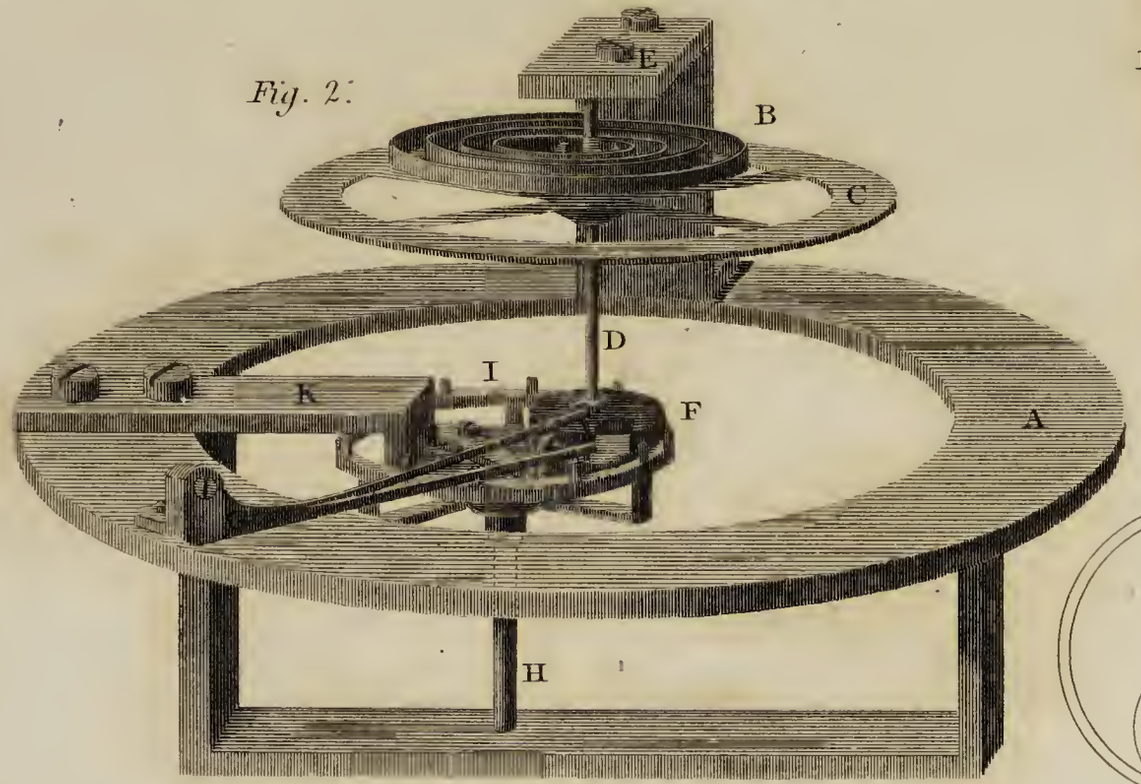
L. The

Fig. 1.



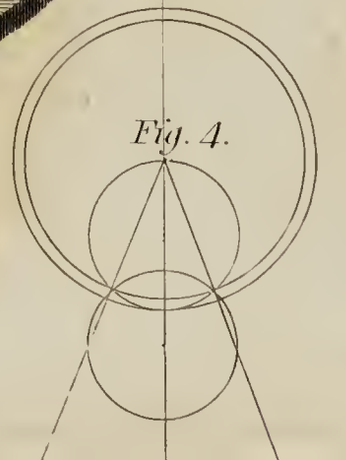
Mr. Antis's Door Latch.

Fig. 2.



Mr Watkins's Improvement

Fig. 4.



Mr Wm Hardy's Compensation Balance.

Fig. 6.

Fig. 5.

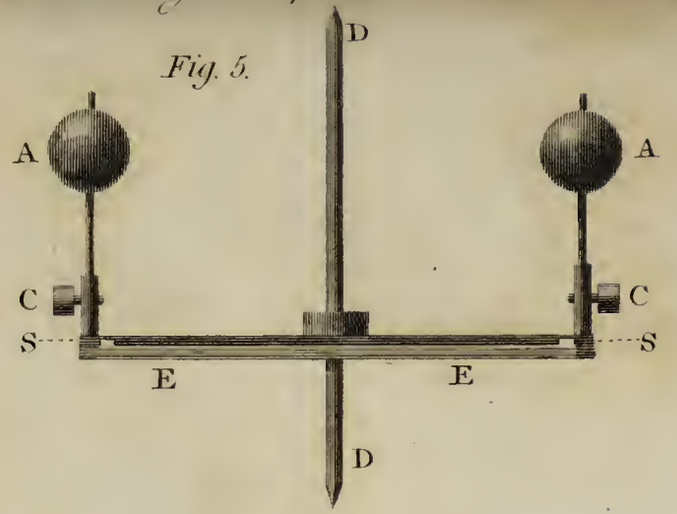
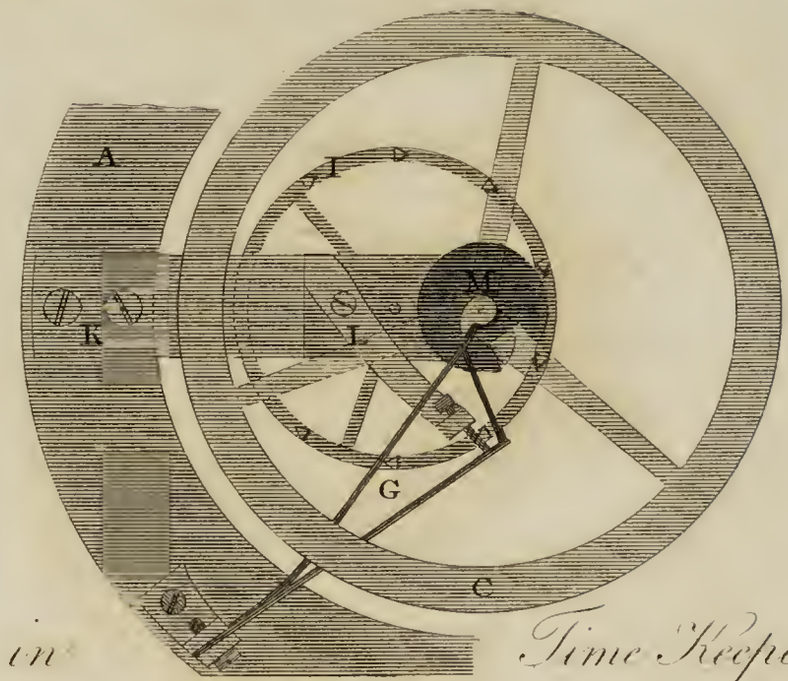


Fig. 3.



in Time Keepers.

C. Varley del.

S. Porter sculp.

K. The cock which supports the axis of the balance and scape-wheel.

L. The screw and small cock for adjusting the locking of the wheel.

Fig. 4, Is a diagram to show Mr. Watkins's intention of reducing friction, by bringing the action more concentric with the scape-wheel.

THIRTY GUINEAS were this Session voted to Mr. WILLIAM HARDY, No. 3, New North-street, Red-Lion-square, for his invention of a COMPENSATION-BALANCE, for TIME-KEEPERS; from whom the following COMMUNICATION was received.

A DRAWING, to explain the nature of this invention, is hereunto annexed, and a MODEL is preserved in the Society's Repository.

SIR,

THE honour done me, and the encouragement which I, last session, received from the Society of Arts, for my contrivance of a banking to a time-keeper, embolden me to trouble the Society with a new compensation-balance, which I conceive to be more perfect and permanent in performance, than

than any hitherto presented to the public; and I have every reason to expect that it will be found of equal, if not greater importance than my last contrivance.

I am, Sir,

Your obliged and humble servant,

WILLIAM HARDY.

CHARLES TAYLOR, Esq.

Description of a new permanent Compensation-Balance for a Time-keeper.

We have at present two compensation-balances: one sort consists of several slips of brass and steel soldered, or fluxed together, and disposed in form of two S S's on the balance, but this is now almost out of use. The other is a steel balance, having a rim of brass fluxed upon its outside, and cut open in two or three places, with sliding weights placed on the rim, to increase or di-

minish the effect of the balance. The nature of this balance (the only one now in use) is well known, as well as its defects, which it is unnecessary for me to state at this time, as I shall have a better opportunity of pointing them out at large, should I be ordered to attend the Society.

Instead of this uncertain way of constructing a balance, which never continues long in the same state, but requires to be adjusted every time the watch wants cleaning; I have rejected this mode altogether, and have contrived a method of applying the direct expansion of metals, which I find by experience to be constant and permanent in its effects.

My balance consists of a steel flat bar, which forms its diameter. Beneath this steel bar are two metallic rods, secured at one end by a stud, formed out of the steel bar, and the other end acting on the short end of a lever, formed

formed out of the other end of the same steel bar, being made to spring at the place where the centre of the lever would fall; to this lever is fastened a small cylindrical stem of brass, upon which a small globe of brass slides or screws; there is also a screw passing through the stem, to serve to regulate to mean time. Another metallic bar, equal and similar, and furnished like the other, but reversed in position, is placed parallel to it.

Mode of acting.

When the whole balance is heated, the metallic rods will push forward the short ends of the levers, and which quantity will be just equal to the difference of the expansion of the two metals. Suppose the short ends of the two levers to be each equal to 1, and the long ends of the levers to be each equal to 20, then it is evident that the

the motion of each globe will be twenty times the excess of the steel bar and metallic rods nearer to the centre of the axis of the balance, than before the expansion took place; and, what is a very grand and necessary property in the motion of the two globes, they will always move directly to the axis of the balance; that is, their action will be constantly in a plane, passing through the axis of the globes and axis of the balance. To increase or diminish the expansion of the balance, will be only to slide or screw up or down the globes upon their stems, until the balance produces the desired effect.

To Charles Taylor, Esq.
Secretary to the Society of Arts, &c.

Feb. 13*th*, 1805.

SIR,

IN addition to what I stated in my last letter, concerning my balance, I beg further to state the following considerations.

The

The rim of brass and steel of the common balance, however intimately connected when first fluxed together, are by every change of temperature endeavouring to break the connexion, and do by little and little tear themselves asunder, at least in a partial degree, for the fracture is often visible, so that the balance has nothing permanent in its nature. New adjustment is necessary much oftener than the instrument requires cleaning: but that adjustment is of no duration; for, as the pores are more torn than at first, the balance becomes worse and worse, and at last quite useless for what it is intended.

I make use of the direct expansion of metals; for the bars of my balance are independent of each other. They are connected only at the extremities, and the excess or difference of the expansion of the two metals is communicated to the short ends of the two spring levers.

levers. Its durability can therefore no more be doubted than that of the grid-iron pendulum, where the direct expansion of metals produces the desired effect.

The two globular weights were described in my last letter as moving constantly in the same plane, which passes through their centres and the axis of the balance; and I should have added that, as to sense, they also move in the same right-line which passes through the centres of the globes, and cuts the axis of the balance at right angles; for the versed sine of a very small arch, or the difference between the radius and co-sine, is in this case a quantity so small that it cannot be perceived; and however we increase or diminish the expansion of the balance, or whatever may be the degree of temperature, it still retains this admirable property, namely, that the two spherical weights move not only in the same plane in a

strict

strict mathematical sense, but also in the same right line in a physical one. This quality, united with the direct motion of the brass bars, renders the motion of the globes simple and uniform, and therefore the effect (depending on such simple and direct causes) is regular and certain.

The common balance, when in motion, causes the weights to fly off or recede from the axis of the balance, and this flying off will increase and diminish with the arch of vibration in the balance: for, as there is nothing to brace the rim at the extremity of which the weight is suspended; as the arch of vibration increases, the weight and rim are thrown outward as much as the centrifugal force of the weight exceeds that of the elasticity of the rim. And as the arch of vibration diminishes, and consequently the centrifugal force, the weight is thrown inward by the elasticity of the rim.

My

My weights or spheres are firmly braced in every degree of temperature, and consequently not influenced in the smallest degree by any change in their centrifugal forces; therefore, in every respect, this balance may be considered as permanent.

The great difficulty in constructing a balance, and in applying the direct expansion of metals, is to contrive it so as that it shall preserve its equilibrium in every degree of temperature, and also admit of having all its parts made perfectly equal and similar by mechanical means. Both these important problems I have solved, by the introduction and application of a different principle from any yet used in the construction of the balance of a time-keeper; and I am fully satisfied, from a variety of experiments which I have made, that by this total change of system, I have made a higher step towards the perfection of time-keepers,

than

than has been effected by any other means that have come within my knowledge.

The real respect which I have for the Society of Arts, will not suffer me to offer any thing that I do not consider of the first consequence; if I am right, I may justly claim the attention of the Society. I have not any other thing (in my own opinion) so worthy of their notice as this *permanent balance*, whose merits I submit to their judgment.

I am, with every sentiment of respect,

SIR,

Your obliged and humble servant,

WILLIAM HARDY.

To CHARLES TAYLOR, Esq.

Secretary to the SOCIETY of ARTS, &c.

Feb. 28th, 1805.

DEAR SIR,

I TAKE the liberty to express my opinion of the compensation-balance, which Mr. Hardy has submitted to the consideration

consideration of the Society of Arts. I think it a very excellent contrivance: the following are some of the reasons which, I presume, will entitle it to the approbation of that respectable Institution.

First.—The invention of confining the flexure of the steel bar to a small part near the end is new, and no less remarkable for its ingenuity and simplicity, than for the steady effect it produces.

Second.—The whole combination is particularly firm; and as the workmanship depends upon faces which are either plain or turned in the lathe, it can very easily be manufactured without requiring uncommon skill in the workman.

Third.—As it has neither working surfaces of contact, nor joints nor levers, it will regularly obey the minute changes of temperature, and will not act by jerks or starts.

Fourth.—

Fourth.—In the expansion-bar consisting of two metals, connected longitudinally by soldering or otherwise, the differences of length between them, when heated or cooled, are found to produce a bending of the whole bar, which is more the thinner its component parts. At the very surface of contact, and at a considerable distance on each side of that surface in thick bars, the principal effect must consist in what workmen would call wire-drawing the one metal, and upsetting the other. It is reasonable to think that this process must affect the properties of a balance so constructed, and cause it to deviate in the course of time from its original adjustment. This objection to the common expansion-balance appears to be obviated in Mr. Hardy's invention. The flexure of the brass takes place through its whole length, in a regular manner, and is in quantity but small; and the flexure in the reduced parts of

the steel bar will be equally slight, if the thickness of that part be made to bear the same proportion to its length. Hence, and upon the whole, it may be concluded that when once it is adjusted, it will not alter, and that in all changes of temperature it will be similarly affected, and will return to its original figure whenever the first temperature is restored.

Fifth.—Artists will probably consider it as a desirable property of the present instrument, that the adjustments for temperature being made in lines nearly parallel to the verge, will have no practical effect in deranging the adjustments for position.

I have the honour to be,

Dear Sir,

Your most obedient servant,

William Nicholson.

Soho-square, March 7th, 1805.

To Charles Taylor, Esq.

A cer-

A certificate, dated March 6th, 1805, was received from Mr. Alexander Cumming, of Pentonville, stating that he had seen Mr. Hardy's expansion balance; that in his opinion it has considerable merit, and promises to act uniformly, steadily, and permanently.

Reference to the Engraving of Mr. Wm. Hardy's Permanent Balance, Pl. XIII. *Fig.* 5, 6; *expressing in inches and decimal parts of an inch, the dimensions of the several pieces.*

Fig. 5. A A. Two globes which slide on the cylindrical stems of two upright levers, and are fastened by screws, by which the effect of the expansion is increased or diminished.

C C. Two equal and similar screws, by which the watch is adjusted to mean time.

D D. The verge or axis of the balance.

E E. The combination of the steel bar with the brass bars.

Fig. 6. S S. The steel bar, whose

length is	1.600
Its breadth	0.232
Its thickness	0.032

B B. Two similar and equal

brass bars, in length each	1.470
In breadth each	0.078
In thickness each	0.032
Length of the two springs formed out of the steel bar	0.030

The

The SILVER MEDAL and TWENTY GUINEAS were this Session voted to Mr. JOHN PRIOR, of Nessfield, near Skipton-in-Craven, Yorkshire, for a LARUM applicable to POCKET WATCHES.

The following COMMUNICATION was received from him; an ENGRAVING of the LARUM is hereunto annexed, and a MODEL reserved in the Society's Repository.

SIR,

SINCE I had the pleasure of seeing you last, I have invented, and shall finish in a day or two, a machine, which by the means of a pocket watch will, without hurting its going, cause a larum to let go at any minute required.

A watch will do for it with any number of turns of the fusee, or which ever

way it is wound up. The whole machine has only one wheel in it, and its main spring wound up and stopped by a method entirely new, which will be very useful to watch-makers, clock-makers, and others.

I am, Sir,
Your humble servant,
JOHN PRIOR.

Nessfield, near Skipton-in-Craven, Yorkshire,
April 21st, 1804.

To CHARLES TAYLOR, Esq.

SIR,

AS the Society for the Encouragement of Arts, &c. have been pleased to countenance some former works of mine, I have taken the liberty to send you a larum marked P, of my own invention and workmanship, which I hope you will have the goodness the first opportunity to lay before that Society

ciety for their inspection, as they perhaps may find it worthy of their consideration.

In constructing this machine, I have endeavoured to make it as simple as I could; so that by the assistance of a pocket watch, of any size, or any number of turns of the fusee, which ever way it is wound up, it will cause the larum to let go at any time required, without hurting the going of the watch.

In winding up the main-spring of this machine, I have used a method different from that of any other person, and which admits of its acting with considerably more power than where thicker pivots are used.

The discovery of stopping the main-spring when wound up without a fusee, I must beg leave to say, gives me a great deal of satisfaction; and will, I hope, be useful to my brother workmen.

To show with what ease a watch will turn the larum screw, I made the following experiment.

When the machine was wound up and the lever put upon the screw, I turned the axis of the screw while one of the pins which has a communication with the key when the watch is put to the larum, was parallel to the horizon; its distance from the centre of motion was one-eighth and three-fourths of an inch. I hung a slender thread upon the pin, with ten grains troy weight tied to it, which moved the screw.

This larum may be set a week beforehand, if the watch would go as long, by increasing the number of threads of the screw.

When a watch is made to wind up the contrary way, it is necessary only to take out the pin in the axis of the detent, and turn the lever the other side up, and then it will drop off at the other end of the screw to disengage the larum.

By taking notice at what hour you wind up your watch, and by winding it up again at twenty-four hours, you will ascertain

ascertain how many hours are contained in one turn of the fusee, the most common are four, five, six, hours for each turn. I have divided the common index into 120, which does for three concentric circles. That next the centre is for a watch fusee of four hours a turn; the next five, and the last six. While the hand of the larum passes over one of the divisions, it will be equal to two minutes to the four hours circle, two and a half to the five hours, and three minutes to the six hours circle, all shown by the same hand.

Before a watch is put to the larum, it must be fitted with a key that will not drop off when the watch is turned with the key-hole downward, something like that which I have sent; then hang up the watch by the pendant to the holder, which may be turned while the key end on the watch is opposite to the axis of the screw, and the face of the watch parallel to the plate.

Then

Then turn the sliding pieces any way, as may suit the watch in that situation, and screw it fast.

Supposing the watch is four hours in making a turn of the fusee, turn back the hand of the larum while one of the pins touches the pin in the watch-key, and if the hand is not at top, turn it back till it is. If the larum is required to go off in four hours, lift the lever into the first turn of the screw; if in five hours, turn back the larum-hand one hour; if in six hours, two back; if in seven hours, three back; and if in eight hours, do not turn it back, but put the lever into the second turn of the screw; and so for the rest.

I am, Sir,
Your very humble servant,
JOHN PRIOR.

Nessfield, near Skipton-in-Craven, Yorkshire,
May 10, 1804.

To CHARLES TAYLOR, Esq.

Mr. John Prior's Larum for Pocket Watches.

Fig. 3.

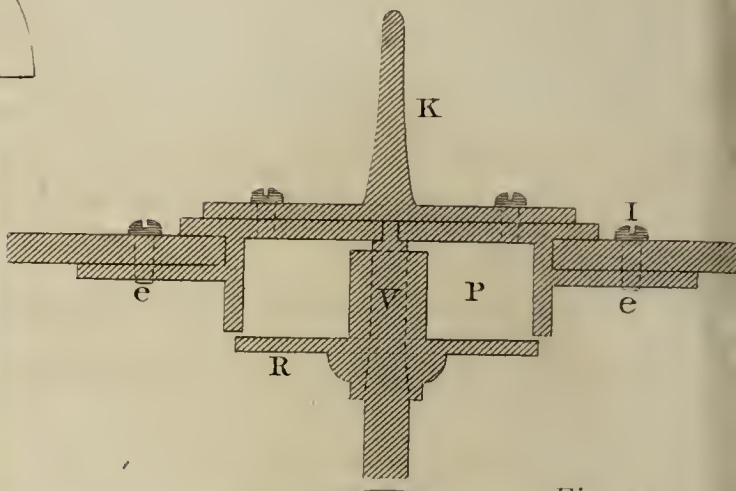


Fig. 5.

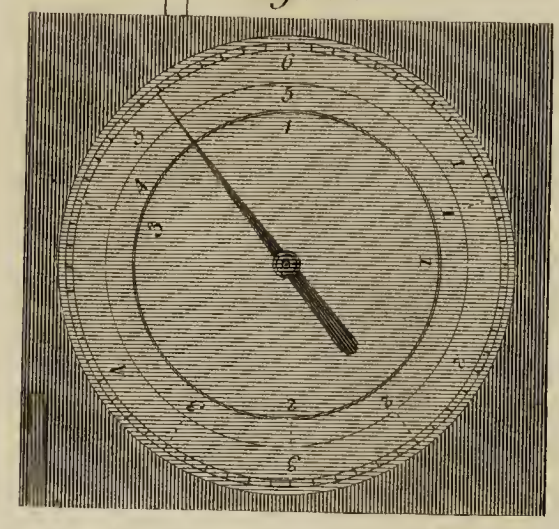
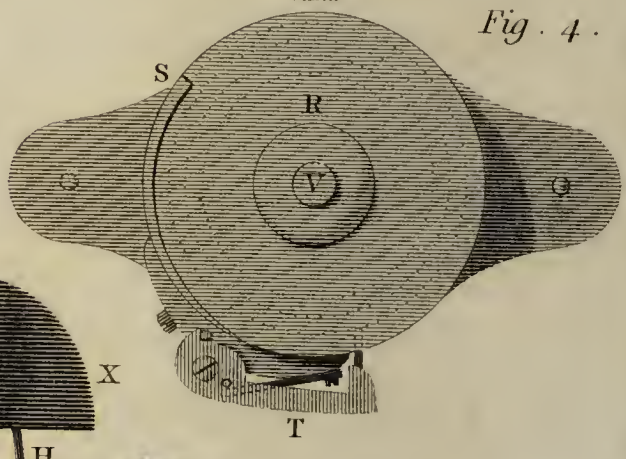


Fig. 4.



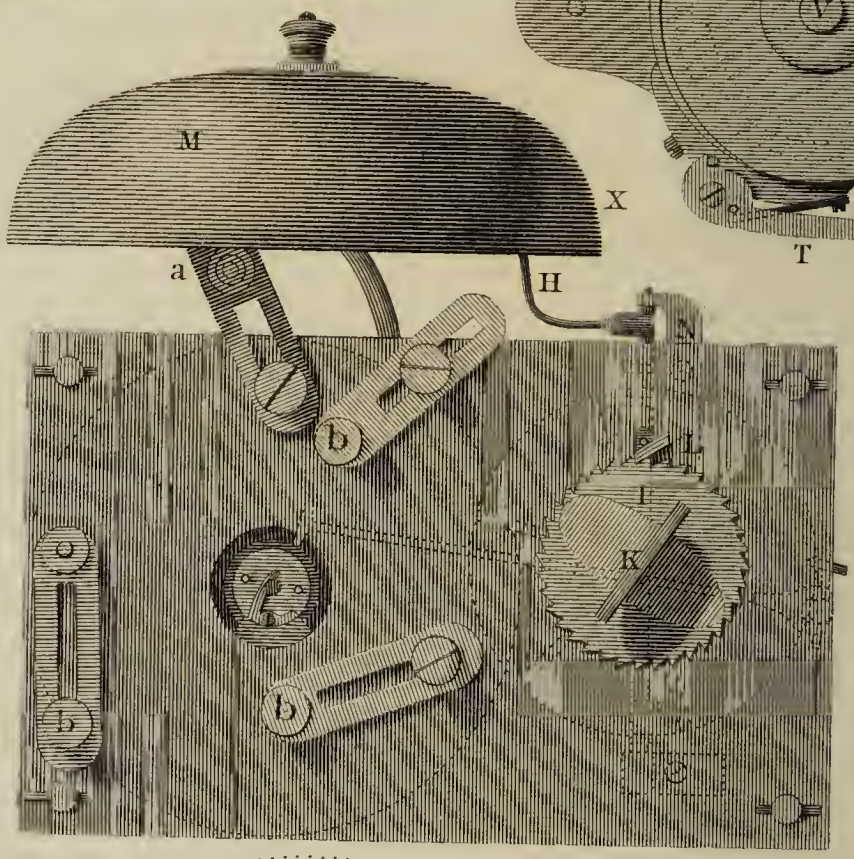


Fig. 2.

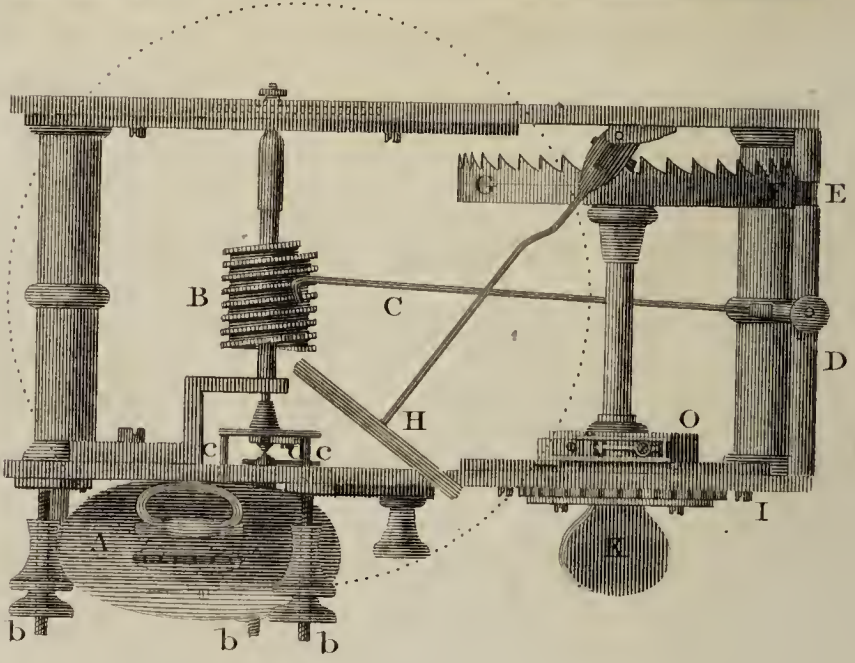


Fig. 1.

Reference to the Engraving of Mr. PRIOR's *Larum. Plate* XIV.

Fig. 1 shows a bird's-eye view of the machine.

A, shows the position of the watch on the larum.

B. The spiral cylinder, fixed on the axis, and moved by a pin across a key placed on the fusee square of the watch.

C. The acting lever, one end of which lies upon the spiral, the other end is moveable upon an arbor D.

E, shows a notch cut in the arbor D. This notch is cut more than half through the arbor, in a situation opposite to a pin at F, in the middle of the rim of the larum contrate-wheel G. When the lever C falls off the cylindrical spire B, the notch E is moved to a situation so as to allow the pin F to pass through the notch which discharges the larum-hammer H, which works by

by pallets in the contrate-wheel G in the usual manner.

O. The barrel which contains the spring, the inner hand of which is connected with the same axis as the contrate-wheel.

K. The finger-piece which winds up the spring.

b, b, b. The three sliding pieces which hold the watch.

c, c. Two projecting pins, which are carried round by the pin *d*, which is fixed across the key fitted to the fusee.

Fig. 2, shows that side of the machine on which the watch is fixed.

a. The sliding piece, on which the pendant of the watch is hung.

b, b, b. The three sliding pieces which serve to adjust the watch, and hold it in such a position that the fusee square may be in a line with the axis of the spiral cylinder B, shown in *Fig.* 1.

I, is

I, is a ratchet-wheel, on the centre of which is a button or finger-piece K, to wind up the larum spring.

L. The click which works in the teeth of the ratchet-wheel.

H. The lower part of the arm of the hammer.

M. The bell, within which the hammer strikes.

N. The cock in which the pivot of the axis of the pallets acts, and to which the hammer is connected.

Fig. 3, shows a section of the ratchet-wheel and spring-barrel, which are screwed together, and move at the same time, but are kept in their place by two pieces *e*, *e*, which fit a groove in the barrel.

K. The button or finger-piece.

I. The ratchet-wheel.

P. The box for the spring.

R. The cap which covers the spring box.

V. The axis on which the main spring is wound.

Fig. 4. R. The cap, under which is the spring. On the edge of this cap, at S, is an indent to retain the spring when wound up.

T. A lever, with a hook at its end.

At the end of this lever, on a line with the hook, is a small piece of steel, which goes through a hole in the box, and presses upon the main spring; so that, when the main spring is wound up on the axis V, the hook is at liberty to fall into the way of the indent S, and is there stopped.

Under the lever T is a small spring, which presses it against the main spring within the barrel.

Fig. 5 shows the index of the larum; the outside circle of which is divided into 120 parts, which index serves for three concentric circles; that

that next the centre is for a watch fusee of four hours a turn, the next five, and the last six, as explained in the letter.

PAPERS

IN

COLONIES AND TRADE.

COLONIES AND TRADE.

The GOLD MEDAL of the Society was this Session voted to Dr. WILLIAM ROXBURGH, of Calcutta, for his valuable Communications on East-India Products.

The following LETTER was received from him, and Specimens of the ALDACAY, or CADUCAY GALLS, with which the Yellow Colour in the India Chintzes is formed, may be seen at the Society's House.

SIR,

I HAVE already returned the Society for the Encouragement of Arts, Manufactures, and Commerce, my thanks for the honour conferred on me by electing me a corresponding member; but the intention of this address is to offer

to the Society a quantity of the dry, full-grown legumes, of Mimosa Arabica. (See Coromandel plants, Vol. II. No. 149).

I have been encouraged to make this offer to the Society in consequence of having observed, in the 19th volume of their Transactions for the year 1801, a paper on the production and application of myrabolans *, and their use as a substitute for Aleppo galls, for which this mimosa fruit is also offered.

The legumes were gathered when nearly full grown; at which period I am inclined to think they possess most tan and astringent matter, without being so much encumbered with the seed as when full

* From the vernacular names *burrah* and *chootah* hurrah, which appear in the above quotation, the myrabolans presented to the Society were the entire fruit of terminalia citrina (and not of phyllanthus emblica); several varieties thereof are to be found in all the bazars over India. The tree is common in this country, which accounts for the fruit (myrabolana citrina, M. M.) being so cheap in Calcutta.

full ripe; when they would add greatly to the bulk of the commodity, and weaken the other powers for which I hope this substance will be found useful.

The drug is packed in two half wine chests, and shipped, by permission of Government, on the ship Hope, Captain Dunbar, and recommended to the care of the Honourable the Court of Directors; who, as well as this Government, are ever ready to encourage such researches.

The chest, No. 1, contains the fruit of April 1803; and, as I had not a sufficiency of that crop to fill the chest with, some of this year's is added at the top, but kept separate by paper. No. 2 contains the fruit of April 1804. My view in sending the drug of different ages, is to ascertain whether it improves or suffers by keeping.

Should this drug be found useful, I am inclined to think large quantities

may be procured annually, at a very moderate expense, not only in Bengal, but on the coast of Coromandel, where the tree is equally plenty, and no use made of the fruit by the natives; so that the expense of gathering, and transportation, is all they would cost.

The tree which produces the yellow myrabolans, mentioned in the foregoing note, also yields a species of galls, of a very irregular shape and yellowish colour. When fresh they are lighter coloured, and darken by age, until they become dark brown, or nearly black. On the coast of Coromandel, where they seem to be better known than in Bengal, they are called Aldacay by the Telingas, and by the Tamuls, Caducay. I have never ventured so far in amongst the mountains as where the galls are found; but, from the information I have been able to collect, it seems that an insect punctures and deposits its eggs

in

in the young tender leaves of the tree, which causes them to swell into the various forms the galls assume.

They are sold in every market, being one of the most useful dying drugs the natives know. Their best and most durable yellow is dyed with them, and fixed with alum. With ferruginous mud they are used to dye black. They are also the chintz painters best yellow. Their astringency seems to be greater than that of the fruit, as an ink made with them resisted the weather longer than that which was made with the pulp which covers the nuts. I am inclined to think they are the Faba Bengalensis of our old Materia Medica writers.

Upon the leaves of this tree I have found an insect, which I take to be the larva of a coccus, or chermes; they are about three eighths of an inch long, and a quarter of an inch broad; flat below, convex above, and composed of twelve

annular segments. The whole insect is replete with a bright yellow juice, which stains paper of a very deep and rich yellow colour. Could these insects be collected in any quantity, I am inclined to think they might prove as valuable a yellow dye as the cochineal is a red.

I beg, Sir, you will inform the Members of the Society, that it will yield me particular pleasure, to be in any shape instrumental in bringing under their notice as many, as in my power, of the numerous treasures, yet little known, with which this extensive empire abounds; which, through their means, must essentially conduce to the advancement of arts, manufactures, and commerce; and, in the mean time, I beg leave to draw the attention of the Society to the following objects:

FIRST.—Resins, commonly called *dammer* in India. They are the produce of various trees, and, when boiled

up

up with oil, are used instead of pitch, in the marine yards throughout India.

SECOND.—A drying oil, or very thin balsam, extracted, by incision, from the trunk of a large tree, which I have called *Oleoxylon Balsamifera*. It grows abundantly in Chittagong, and is chiefly used in painting.

THIRD.—Vegetable substances, and their extracts, containing the tanning and astringent principles, abound in India, probably more than in any other country in the world.

FOURTH.—Substitutes for hemp and flax are numerous over Asia. In my essay on these, above twenty are already enumerated. If found to answer, of which there is little doubt if put to the test of fair experiment, they might soon form a considerable addition to the export trade of these countries, and of use to the manufactures of the mother country. This appears to be a most important object, deserving the greatest encourage-

encouragement, even when on the best of terms with Russia.

FIFTH.—The coarse silks, spun by the wild tussah and domesticated Berinda worms. The latter is soft as shawl wool, and incredibly durable.

SIXTH.—The very fine, delicate, silky wool, the produce of the two trees, bombax pentandria and heptaphylla, if still found unfit for the loom, might answer for hats, or some other such purpose, where the very softest hair of animals is employed.

I have the honour to be, SIR,

Your most obedient,

Humble servant,

W. ROXBURGH.

Calcutta, June 18, 1804.

From subsequent information which the Society have received, the ship Hope, containing the legumes of the mimosa Arabica, was taken by the French, and no other specimens of that article have yet been sent.

The

The Sum of THIRTY-FIVE DOLLARS was this Session voted to Mr. WILLIAM HUGHES, of Upper Canada, for the CULTURE of HEMP in that Province.

The following COMMUNICATIONS were received from him; and SAMPLES of the HEMP and SEED are preserved in the Society's Repository.

SIR,

IN the present year I sowed, with hemp seed, two and a half acres of land, broadcast, having twice ploughed the land before sowing the hemp-seed. The first ploughing was in the beginning of April; the second ploughing and harrowing was on the thirteenth and fourteenth of May, immediately previous to the sowing. The hemp produced on the said two and a half acres was plucked on the sixteenth and seventeenth of August, and the produce thereof

thereof amounted to one thousand eight hundred and forty-three pounds averdupoise weight. The soil was a black loamy clay, and no dung was used thereon.

The Expenses of Cultivation were as follow, viz.

	£.	s.	d.
Twice ploughing	0	15	0
Once harrowing	0	7	6
Plucking	3	5	0
Binding	0	7	6
Sowing	0	2	6

The above is Halifax currency, which is in proportion of eighteen shillings sterling to the pound.

I am, Sir,

Your obedient servant,

WILLIAM HUGHES.

Gonge-street, Upper Canada,
October 24, 1803.

To CHARLES TAYLOR, Esq.

Certificates

Certificates from his Excellency Peter Hunter, Esq. Lieutenant-Governor of the province of Upper Canada, and from William Allan, Esq. and William Graham, Esq. two of his Majesty's Justices of the Peace within the home district of the said province, confirmed Mr. Hughes's statement.

SIR,

I HAVE the honour to acknowledge the receipt of your duplicate letter of the 30th of June (the original of which has never reached me), acquainting me that the Society for the Encouragement of Arts, Manufactures, and Commerce, have voted three Rewards for the Culture of Hemp in Canada, viz. A Gold Medal to J. W. Clarke, Esq. of Montreal; a Gold Medal, or One Hundred Dollars, at the option of the Candidate, to Mr. Jacob Schneider, of York, in Upper Canada; and a Silver Medal,

Medal, or Eighty Dollars, at the option of the Candidate, to Mr. Daniel Mosher, of Kingston, in Upper Canada. Which rewards, I am persuaded, will have the most salutary effects on the industry of the inhabitants of the Canadas.

I have the honour to be,
SIR,
Your obedient,
Humble servant,
P. HUNTER.

York, Upper Canada,
Nov. 18, 1804.

CHARLES TAYLOR, Esq.

The THANKS of the SOCIETY were this Session voted to Mr. WILLIAM VONDENVELDEN, of Quebec, for the following COMMUNICATION relative to the Products of that Province.

SPECIMENS of the SEED, DOWN, and SUGAR, mentioned in his Letter, are preserved in the Repository of the Society.

SIR,

I TAKE the liberty to send you the seed and produce of a plant, which, unless it be already known to the Society, as being noticed in Botanical works, may possibly arrest the attention of its Members for a few moments. It grows very abundantly in the most barren fields of this country. It is vulgarly called *cotonnier*, cotton-plant. The farmers use the silky substance it produces as a substitute for feathers for bedding. It makes its first appearance

of

of vegetation early in May, much like an asparagus, and is taken up, sold, dressed, and eaten, much in the same manner. If left to grow, it rises into a plant about 18 inches high, bears a flower (resembling the lilac, but of a finer, though weaker, fragrance) in the beginning of August, when an abundant dew is found every morning, for about a fortnight, on its leaves and flowers; which being shaken off before, or immediately after, sun-rise, into basons, a quantity of a liquid is thus gathered, which being reduced by boiling into a solid substance, yields a sugar, of which you have also herewith a specimen. I should not have entered into this detail, but an idea has struck me that this silky substance may probably be introduced, with great advantage, into the manufacture of writing-paper; at least in part, by mixing it, in due proportion, with linen and other rags; in which case great quantities thereof could

could easily be procured from this province. Should you think it worth while to make some inquiries in regard to this suggestion, and that some manufacturers would wish to try the experiment, a sufficient quantity for that purpose might easily be sent next year.

I am, Sir,

Your obedient humble servant,

WILLIAM VONDENVELDEN.

Quebec, Oct. 3, 1804.

To CHARLES TAYLOR, Esq.

REWARDS

BESTOWED BY THE

SOCIETY,

From October, 1804,

To June, 1805.

REWARDS.

Society of Arts,
Manufactures, and Commerce.

ON Wednesday, the 5th day of June, 1805, the Society held their last meeting in that Session, and adjourned to the fourth Wednesday in October following.

On Tuesday, the 28th of May, agreeably to the Resolutions of the Society, the Premiums and Bounties which had been then adjudged during the Session, were delivered to the Claimants, from the Chair, by his Grace the Duke of NORFOLK, the President, in presence of a very numerous assembly of Noblemen, Ladies, and Gentlemen. An Address, applicable to the occasion, was made by the Secretary, and the Rewards were presented in the following order of arrangement:

IN AGRICULTURE.

To the Right Hon. the Earl of BREADALBANE, Park-lane, for Plantations of Fir Trees, the SILVER MEDAL. See page 24.

To THOMAS JOHNES, Esq. M. P. Hafod, Cardiganshire, for Planting Oaks, Class 3, the GOLD MEDAL. See page 26.

To J. C. CURWEN, Esq. M. P. Workington Hall, for the Culture of Beans and Wheat, Class 32, the GOLD MEDAL. See page 30.

To Mr. WILLIAM TAYLOR, Beamish, Durham, for improving Land lying waste, Class 60, the GOLD MEDAL, or THIRTY GUINEAS. See page 46.

To Captain JOHN MILLER, New Park, Axminster, Devonshire, for a pair of Sheep Shears, the SILVER MEDAL. See page 69.

To SAMUEL TAYLOR, Esq. Moston, for

for the growth of White Thorn, the SILVER MEDAL. See page 77.

To Mr. W. WALLIS MASON, Goodrest Lodge, near Warwick, for the Culture of Carrots, the SILVER MEDAL. See page 87.

To Mr. JOHN FAREY, Crown-street, Westminster, for Experiments in the growth of Timber, the SILVER MEDAL. See page 112.

To Mr. WILLIAM SMITH, Buckingham-street, for irrigating Boggy Land, the SILVER MEDAL. See page 148.

To Mr. WILLIAM WATSON, North Middleton, for comparative Culture of Turnips, TEN POUNDS. See page 173.

To Mr. SETH BULL, Ely, for Planting Osiers, Class 14, THIRTY GUINEAS. See page 183.

IN CHEMISTRY.

To Mr. THOMAS VANHERMAN, for Paints made with Fish Oil, the SILVER

MEDAL, and TWENTY GUINEAS. See page 193.

To Mrs. JANE RICHARDSON, No. 3, Willis's-place, Chelsea, for Clearing Feathers from their animal oil, Class 90, TWENTY GUINEAS. See page 210.

To Mrs. ANNE MORRIS, No. 41, Union-street, near Middlesex Hospital, for her method of cleansing Silk, Cotton, and Woollen Goods, FIFTEEN GUINEAS. See page 216.

IN POLITE ARTS.

To Miss H. AUGUSTA JACKSON, Hanover-street, Hanover-square, for an original Drawing of Venus Marina, and Cupids, Class 124, the GOLD MEDAL.

To Miss MARY HAY, of Chandos-street, for a Drawing in Chalk of our Saviour taken from the Cross, Class 125, the SILVER MEDAL.

To Miss HANCOCK, St. Helen's, Norwich, for an Oil Painting of an old Woman,

Woman, after Nature, the SILVER MEDAL.

To Mr. THOMAS PALMER, at J. G. Walker's, Engraver, Hammersmith, for a Pen and Ink Drawing of a Human Figure, the SILVER MEDAL.

To Miss MARY ANNA JONES, No. 103, Leadenhall-street, for a Drawing of a Landscape, Class 128. A Drawing from Nature of Gorhambury, near St. Alban's, formerly the seat of Lord Bacon, Baron of Verulam, the GOLD PALLET.

To Mr. HENRY CORBOULD, No. 70, John-street, Fitzroy-square, for an Historical Drawing, Class 130, Ajax defending the Body of Patroclus, the GOLD PALLET.

To Miss COCKERELL, Westbourne, Paddington, for a Drawing of the Virgin, Christ, and St. John; the GREATER SILVER PALLET.

To Mr. GEORGE JONES, No. 74, Great Portland-street, Mary-le-Bone, for an

an Historical Drawing, Class 131, Ulysses's Descent into Hell, the GREATER SILVER PALLET.

To Miss ZORNLIN, No. 42, Newington Place, Kennington, for a Drawing of the Venus de Medicis, from a Cast, the LESSER SILVER PALLET.

To Miss S. C. DAY, No. 5, Lower Bryanston-street, for an original historical Drawing of Calypso, inviting Telemachus to a Banquet, the LESSER SILVER PALLET.

To Miss ELIZABETH PORRET, of the Tower, for a Chalk Drawing from one of Raphael's Cartoons, the LESSER SILVER PALLET.

To Mr. WILLIAM WARD, North End, Hampstead, for a Drawing of Ewell Church, the LESSER SILVER PALLET.

To Miss MARY HAY, as an additional compliment to the great excellence of her performance, TWENTY GUINEAS.

IN MANUFACTURES.

To Mr. William Corston, Ludgate-hill, for a Substitute for Leghorn Plait for Hats, &c., the Gold Medal. See page 223.

To Mr. J. Beard, of Coggeshall, for crooking Wires for Cards, used in the Cotton and Woollen Factories, the Silver Medal and Forty Guineas. See page 233.

To Mr. John Austin, Glasgow, for various Improvements in Manufactures, the Silver Medal. See page 238.

IN MECHANICKS.

To Mr. George Smart, Ordnance Wharf, Westminster Bridge, Class 172, for Chimnies Cleansed by Mechanical Means, the Gold Medal. See page 255.

To Mr. Gilbert Gilpin, Old Park Iron Works, Shifnal, for a Crane for raising

raising Weights, the SILVER MEDAL, and THIRTY GUINEAS. See page 267.

To Mr. JOHN PRIOR, Nessfield, Yorkshire, for a Larum for Pocket Watches, the SILVER MEDAL, and TWENTY GUINEAS. See page 393.

To Mr. ROBERT SALMON, Woburn, for an Improvement in Canal Locks, the SILVER MEDAL, and TEN GUINEAS. See page 333.

To Mr. JOSEPH DAVIS, No. 14, Crescent, Kingsland Road, for a Day and Night Telegraph, the SILVER MEDAL, and TEN GUINEAS. See page 323.

To Mr. ROBERT SALMON, Woburn, for a Geometrical Quadrant and Staff, the SILVER MEDAL, and TEN GUINEAS. See page 290.

To Mr. J. J. HAWKINS, Dalby Terrace, City Road, for a Machine for cutting Paper and the Edges of Books, the SILVER MEDAL. See page 347.

To Mr. JOHN ANTIS, Fulneck, near Leeds,

Leeds, for improved Door Latches, the SILVER MEDAL. See page 365.

To Mr. ANDREW FLINT, for an expanding Band-wheel, FIFTY GUINEAS. See page 329.

To Mr. WILLIAM HARDY, No. 1, Knowles-buildings, Islington, for a compensation Balance, THIRTY GUINEAS. See page 378.

To Mr. J. WATKINS, No. 9, Gilt-spur-street, West Smithfield, for an improvement in Time-Keepers, THIRTY GUINEAS. See page 368.

To Mr. JOHN ANTIS, Fulneck, near Leeds, for a detached Escapement of a Pendulum Clock, TWENTY GUINEAS. See page 359.

To Mr. THOMAS PARKER, No. 6, Blue-Cross-street, Leicester-fields, for a Machine for Shoe-makers, FIFTEEN GUINEAS. See page 285.

To Mr. HENRY WARD, Blandford, for a new Striking Clock Movement, FIFTEEN GUINEAS. See page 353.

To

To Mr. Peter Herbert, No. 33, Bow-street, Covent-Garden, for a Book-case Bolt, Ten Guineas. See page 313.

To Mr. Charles Le Caan, Llannelly, for a Check to Carriage Wheels, Ten Guineas. See page 316.

IN COLONIES and TRADE.

To Dr. William Roxburgh, Calcutta, for Communications on India Products, the Gold Medal. See page 407.

To Mr. William Hughes, Upper Canada, for the Culture of Hemp, Thirty-Five Dollars. See page 414.

PRESENTS

RECEIVED BY THE

SOCIETY,

FROM JUNE, 1804, TO JULY, 1805,

With the NAMES of the DONORS.

ROYAL SOCIETY.

THE First and Second Parts of the Philosophical Transactions for the year 1803, and the First Part for the year 1804.

SOCIETY OF ANTIQUARIES.

An engraved View of the Old Palace at Hampton-Court, three Engravings.

The ROYAL HUMANE SOCIETY,
By Dr. HAWES.

Their annual Report.

LINNÆAN

LINNÆAN SOCIETY.

The Seventh Volume of their Transactions.

AMERICAN PHILOSOPHICAL SOCIETY.

Part I. of Vol. VI. of their Transactions.

LORD CLIFFORD.

Two Specimens of Devonshire Marble.

The COMMITTEE of WAREHOUSES of the Honourable EAST-INDIA COMPANY. By ROBERT WISSET, Esq.

Part II. of Vol. II. of East-India Serpents.

No. IV. of the Second Volume of the Plants of the Coast of Coromandel.

Mr. J. AUSTIN.

A new System of Stenographic Musick.

The AUTHOR.

Essay on the Mildew in Wheat.

Mr.

Mr. Brown, of Markle.

The 18th, 19th, 20th, 21st, and 22nd Nos. of the Farmer's Magazine.

Observations on the Review of Mr. Hunter's Letter.

Francis Burroughs, Esq.

A poetical Epistle to James Barry, Esq.

Mr. J. Carpenter.

A Treatise on Agriculture, 2 vols. 8vo.

Mr. William Chamberlaine.

A practical Treatise on Stizolobium, or Cowhage.

A Pamphlet on the new Medicine Act.

Mr. A. Edlin.

A Treatise on the Art of Bread-making.

Mr. Thomas Fisher.

An Engraving of a Roman tesselated Pavement.

Mr. Joyce Gold.

An engraved Map of Indostan, drawn by Major Rennell.

The 11th and 12th Volumes of the Naval Chronicle.

Thomas Goodwin, Esq.

An Account of the neutral Saline Waters of Hampstead.

Mr. Grece.

A Specimen of Bark from Canada.

The Housekeeper.

Lettres d'un Voyageur Anglois, 2 vols. 8vo.

Mr. Laurent.

A Map of Altona.

A Map of Hamburgh.

Mr.

Mr. J. Loudon.

Observations on Planting and Gardening, 8vo.

Richard Powell, M.D.

Macquer's Chymisches Werterbuch; being a translation into German, by Leonhardi, 7 vols. 8vo.

Macquer's Dictionary of Chemistry, 3 vols. 8vo.

Keir's Chemical Dictionary, Vol. I. 4to.

The Secretary.

Hanway's Treatise on Naval Education, folio.

R. H. Solly, Esq.

An Inquiry into the Obstructions to the Acquisition of the Arts in England. By James Barry, Esq.

William Tooke, Esq.

An engraved Plan of the East-India Docks.

The Horrors of Negro Slavery.

WILLIAM VAUGHAN, Esq.

Captain Woodward's Narrative, 8vo.

JOHN WYATT, Esq.

The new Series of the Repertory.

Three Numbers of the Retrospect.

A CATA-

A CATALOGUE

OF THE

MODELS AND MACHINES

Received since the Publication of the Twenty-second Volume of the Society's Transactions, with the Numbers as they are arranged in the Classes to which they belong.

MANUFACTURES. CLASS III.

No. XXXVIII. A SAMPLE of English Straw Plait, for Hats, resembling Leghorn, by Mr. William Corston. See page 223.

XXXIX. A Machine for cutting and crooking Wires for Cards, used in the Cotton

No. and Woollen Factories, by Mr. J. Beard. See page 233.

XL. Spotting Shuttles, used in weaving Muslins, by Mr. J. Austin. See page 238.

XLI. Earthen or porcelain Types and Sprigs for Calico Printers, or for spotting Muslins, by Mr. J. Austin. See page 238.

MECHANICKS. CLASS IV.

CCXVII. A Brush and Machine for cleaning Chimnies, by Mr. George Smart. See page 255.

CCXVIII. A Model of a Crane for raising Weights, by Mr. Gilbert Gilpin. See page 267.

CCXIX. A

No. CCXIX. A Larum for Pocket Watches, by Mr. John Prior. See page 393.

CCXX. A Model of an Improvement in Canal Locks, by Mr. Robert Salmon. See page 333.

CCXXI. A Model of a Day and Night Telegraph, by Mr. Joseph Davis. See page 323.

CCXXII. A Geometrical Quadrant and Staff, by Mr. Robert Salmon. See page 290.

CCXXIII. A Model of a Machine for cutting Paper and the Edges of Books, by Mr. J. J. Hawkins. See page 347.

CCXXIV. An improved Door-Latch, by Mr. J. Antis. See page 365.

No. CCXXV. A Model of an expanding Band-Wheel, by Mr. Andrew Flint. See page 329.

CCXXVI. A Compensation Balance for Time-keepers, by Mr. William Hardy. See page 378.

CCXXVII. A Model to reduce Friction in Time-keepers, by Mr. J. Watkins. See page 368.

CCXXVIII. A detached Escapement and Remontoir, by Mr. John Antis. See page 359.

CCXXIX. A Machine for preventing Diseases to Shoemakers from bending over their Work, by Mr. Thomas Parker. See page 285.

CCXXX. A new Striking Clock Movement,

No. Movement, by Mr. Henry Ward. See page 353.

CCXXXI. A Book-case Bolt, which closes and opens by the Lock, by Mr. Peter Herbert. See page 313.

CCXXXII. A Model of a Check or Stop for Carriage Wheels, by Mr. Le Caan. See page 316.

A LIST

OF THE

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AND

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OF THE SEVERAL

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FOR THE

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Young, William, jun. Esq. No. 2, *James-street, Adelphi*

P Zeno-

Z.

P Zenobio, Right Honourable Count Alvise

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Titford, Isaac, M.D. *Spanish Town, Jamaica*
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Vitoftoff, his Excellency Mr. Alex. *Petersburgh*
Deriabin, Mr. Andrew, *ditto*

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